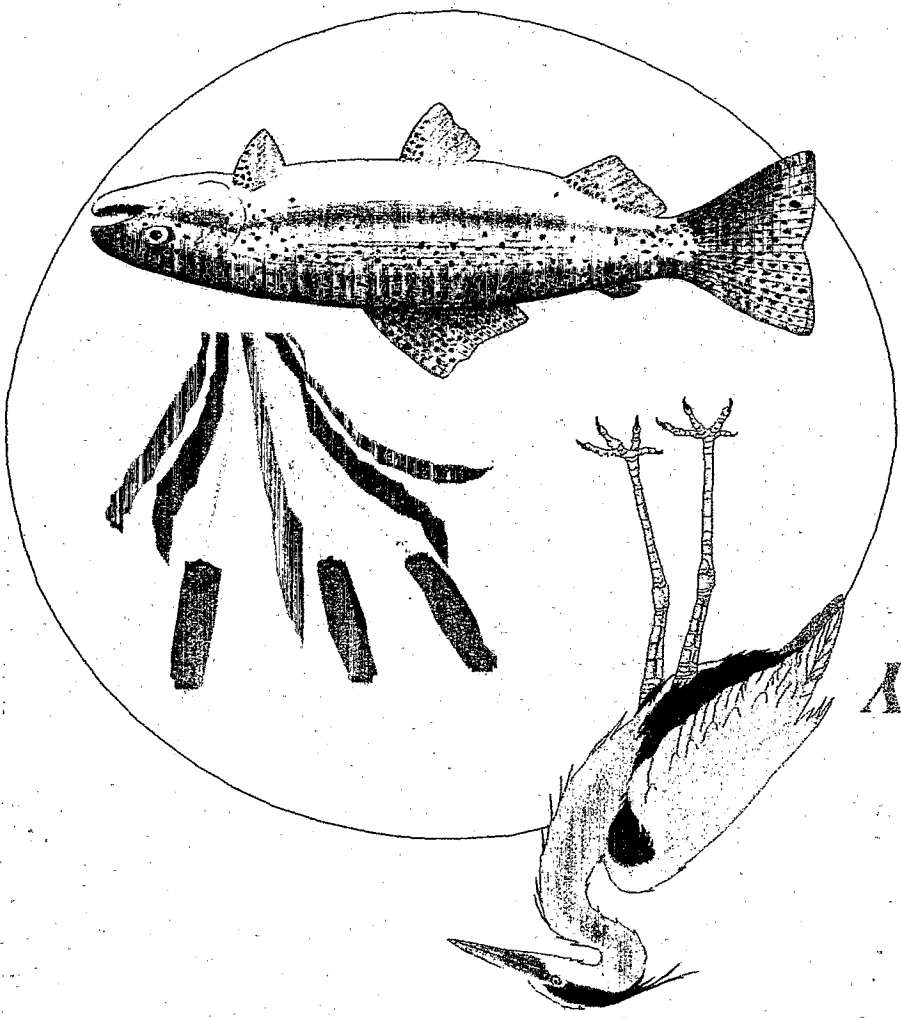


ECOSYSTEM RESTORATION PROGRAM PLAN

EXECUTIVE SUMMARY AND TABLES WORKING DRAFT

APRIL 8, 1997



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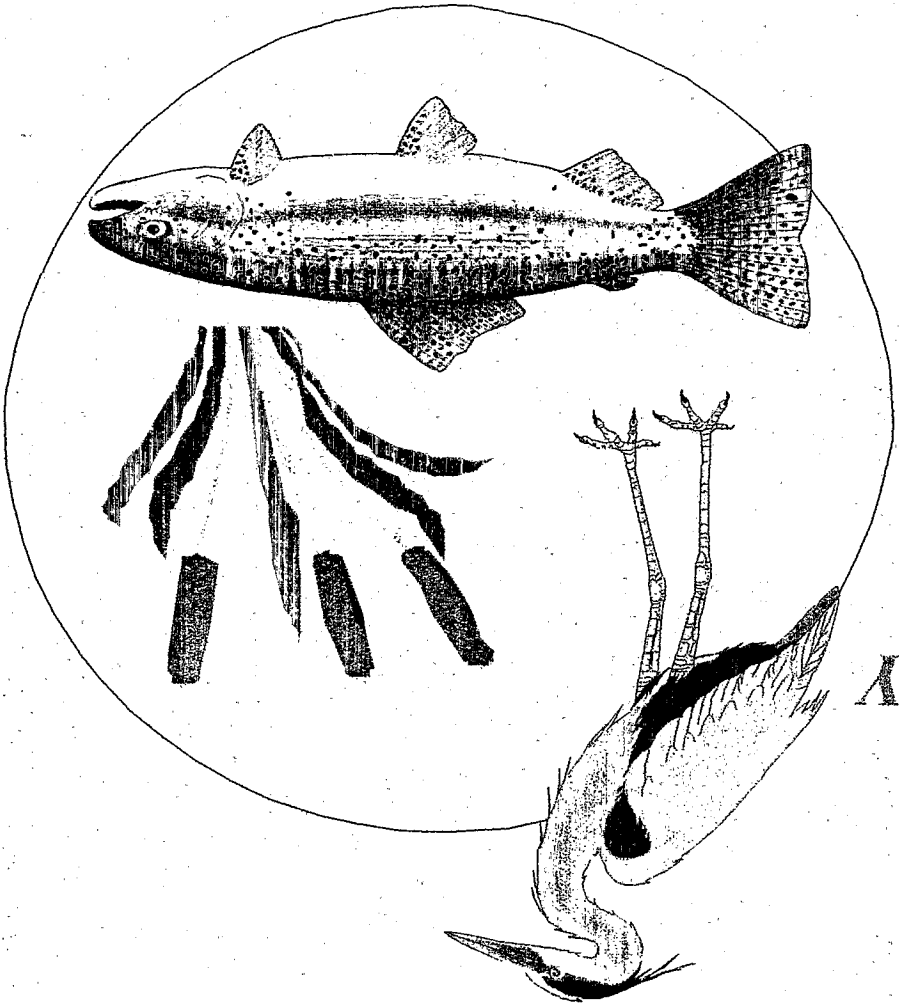
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ECOSYSTEM RESTORATION PROGRAM PLAN

EXECUTIVE SUMMARY AND TABLES WORKING DRAFT

APRIL 8, 1997



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CALFED
BAY-DELTA
PROGRAM

April 8, 1997

Dear Reviewers:

We are pleased to provide you with the summary and tables for the Ecosystem Restoration Program Plan (ERPP). Our purpose for releasing a summary at this time is to stimulate discussion and set the stage for a series of regional discussions which we will conduct during April and May.

We have modified our original schedule in order to release this summary and facilitate additional discussion. Our intent is to improve the consistency and quality of the ERPP. We expect to make Volume One available by the end of April and Volumes Two and Three by late May. When all three volumes are available to the public, we will set a 45-day review period and conduct a workshop near the end of that review period.

As you review the summary, please keep the following points in mind:

- ▶ Adaptive management is the process for implementation of the ERPP.
- ▶ Monitoring, indicators and focused research will be the tools used to modify the targets over what will likely be a 25-year implementation period.
- ▶ Not all targets have an equal scientific foundation. We acknowledge the need to conduct field pilot projects and research to refine the program.

Finally, we know there is some risk associated with putting out a summary without the foundation material and detailed rationale. Please use the summary and the tables to stimulate your thinking and formulate your opinions, then pass your ideas along to CALFED so we can continue to refine the plan. If you would like to host or participate in a discussion and further refinement of the ERPP, please contact Dick Daniel at (916) 657-2666.

Thank you for your interest and review.

Sincerely,



Lester A. Snow
Executive Director

CALFED Agencies

California

The Resources Agency
Department of Fish and Game
Department of Water Resources
California Environmental Protection Agency
State Water Resources Control Board

Federal

Environmental Protection Agency
Department of the Interior
Fish and Wildlife Service
Bureau of Reclamation
Department of Commerce
National Marine Fisheries Service

CALFED BAY-DELTA PROGRAM ECOSYSTEM RESTORATION PROGRAM PLAN EXECUTIVE SUMMARY AND TABLES

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CALFED BAY-DELTA PROGRAM

ECOSYSTEM RESTORATION PROGRAM PLAN

EXECUTIVE SUMMARY AND TABLES

INTRODUCTION

The mission of the CALFED Bay-Delta Program is to develop a long-term comprehensive plan that will restore ecosystem health and improve water management for beneficial uses of the Bay-Delta system. The Program addresses problems in four resource areas: ecosystem quality, water quality, system integrity, and water supply reliability. Programs to address problems in the four resource areas will be designed and integrated to fulfill the CALFED mission.

The goal for ecosystem quality is to improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plant and animal species. The CALFED Ecosystem Restoration Program Plan (ERPP) addresses this goal. The foundation of the program is restoration of ecological processes that are associated with streamflow, stream channels, watersheds, and floodplains. These processes create and maintain habitats essential to the life history of species dependent on the Delta. In addition, the Program aims to reduce the effects of stressors that inhibit ecological processes, habitats, and species.

The ecological hub of the Central Valley is the Sacramento-San Joaquin Delta and Bay. The ERPP signals a fundamental shift in the way ecological resources of the Central Valley are managed. For many decades, government entities, non-profit organizations, and the private sector have engaged in managing, protecting, regulating, and in some cases breeding fish and wildlife species of the Bay and Delta - yet many populations have not recovered sufficiently and remain in decline. In spite of constant human intervention to repopulate fish and wildlife that have commercial, recreational, and biological importance to society (e.g., hatchery programs and expensive re-engineered water diversions), populations have not been sustained at stable, healthy levels that support historic economic utilization of those resources.

Efforts at individual species regulation and management will be replaced by an integrated systems approach that aims to reverse the fundamental causes of decline in fish and wildlife populations. A systems approach will recognize the natural forces that created historic habitats and use these forces to help regenerate habitats. The Bay-Delta ecosystem is not simply a list of species. Rather, it is a complex living system sustained by innumerable interactions that are physical, climatic, chemical, and

biological in nature, both within and outside of the geographic boundaries of the Delta. The central theme of the ERPP is the recognition that truly durable and resilient populations of all fish and wildlife inhabiting the Bay and Delta require, above all else, the rehabilitation of ecological processes throughout the Central Valley river and estuary systems and watersheds.

The ERPP is fundamentally different from many past efforts in another way as well. It is not designed as mitigation for projects to improve water supply reliability or to bolster the integrity of Delta levees; improving ecological processes and increasing the amount and quality of habitat are co-equal with other program goals related to water supply reliability, water quality, and system integrity. Solving serious and long-standing problems in each of these resource areas will require an ambitious, integrated, long-term program.

The ERPP, like all components of Bay-Delta solution alternatives, is being developed and evaluated at a programmatic level. The complex and comprehensive nature of a Bay-Delta solution means that it will necessarily be composed of many different programs, projects, and actions that will be implemented over time. During the current phase of the Program, solution alternatives will be evaluated as sets of programs and projects so that broad benefits and impacts can be identified. In the next phase of the Program, more focused analysis and environmental documentation of specific programs and actions will occur.

The CALFED goal for ecosystem quality will be achieved by developing implementation objectives and targets and programmatic actions that can be implemented to restore ecological processes. The restoration of these processes is intended to restore and maintain habitats, and to provide for the needs of the species dependent on a healthy Bay-Delta system. For example, restoring stream channels contributes to sediments, nutrients, and a variety of habitats. The strategy recognizes that not all processes can or should be completely restored and that intervention, manipulation, and management will be required. For example, streambed gravel may have to be introduced, habitats may have to be constructed, and vegetation planted. Still, an important part of the approach is to recommend measures that in the long-term will limit the need for human intervention.

Implementation of the ERPP is further guided by the recognition that all landscape units and physical and biological components of the ecosystem are interdependent and dynamic. Interdependence means that actions and stressors in one part of the system can and do affect populations and conditions that may be separated by hundreds of miles (e.g., in watersheds and spawning tributaries), or affect the food web in ways that may not be felt for several years.

Dynamic refers to the exposure of natural systems to constant cycles of change in response to both human and natural factors. Most habitats undergo expansions and contractions, or shifts in space and time. The dynamic nature of healthy habitats is the

cause of much biological diversity, and complex habitats tend to make species populations more resilient to change. If the mosaic of habitats distributed across a broad landscape is complex, and if large areas of habitat are connected by smaller patches and corridors such as those associated with riparian systems, then healthy areas of the ecosystem can be relied upon to sustain species during temporary setbacks in other areas.

GEOGRAPHIC SCOPE

The geographic scope of the ERPP is defined by the interdependence and linkage of watersheds, streams, rivers and the Bay-Delta and the complex life histories of the dependent fish, wildlife and plant communities. The restoration of ecological processes requires implementation of actions throughout much of the Central Valley, its upper watersheds, the Bay-Delta, and near shore ocean. The primary geographic focus is the Bay-Delta, the Sacramento River, the San Joaquin River, and their tributary watersheds directly connected to the Bay-Delta system below major dams and reservoirs. Secondly, the ERPP addresses, at a programmatic level, the near-shore ocean and the upper watersheds above the major dams.

The primary geographic focus area for the ERPP can be divided into 14 zones, each characterized by a predominant physical habitat type and species assemblage. These 14 ecological zones constitute the geographic areas in which the majority of restoration actions will occur. The upper watersheds surrounding

the primary focus area are important and addressed through general actions that focus on watershed processes.

IMPLEMENTATION STRATEGY

A large and diverse ecosystem like the Bay-Delta is extremely complex. There are many processes and relationships at work in the ecosystem that are not fully understood. Thus, there are many difficulties and uncertainties associated with a program to improve ecosystem health. In some cases, problems are well understood and the steps to improvement are clear. In other cases, there is some understanding of the reasons for decline but this understanding is not sufficient to warrant full-scale implementation of remedial measures. In still other cases, additional research is needed before solutions can be identified with certainty.

The difficulties and uncertainties of ecosystem restoration call for an implementation strategy that is flexible and can accommodate and respond to new information. The foundation of the ERPP implementation strategy is **adaptive management**. Adaptive management is a process of testing alternative ways of meeting objectives, and adapting future management actions according to what is learned. Adaptive management relies upon the identification of indicators of ecosystem health, comprehensive monitoring of indicators to measure improvement over time, focused research, and phasing of actions.

Indicators are features or attributes of the ecosystem that are expected to change over time in response to implementation of the ERPP. Indicators are selected to provide measurable evaluations of important ecological processes, habitats, and species whose status individually and cumulatively provide an assessment of ecological health. Indicators of ecosystem health are the gauges we will use to measure progress toward the goal. Some indicators are very broad in scale while others are very specific. For example, a very broad or landscape level indicator of ecosystem health might be a comparison of the total area of riparian forest to historic coverage or an evaluation of the average distance between patches of such forest with closer patches indicating better health than more distant patches. A more specific indicator might be the concentration of toxic substances in the flesh of adult striped bass.

Comprehensive monitoring is the process of measuring the abundance, distribution, change or status of indicators. For example, contaminant concentrations in fish tissues can be measured at various locations and times in the system to determine if contaminant levels are changing. This will allow progress to be measured, allow actions to be modified if necessary, and provide assurances that the restoration objectives are being achieved.

Focused research will help answer questions about the system and its components and increase the certainty surrounding the relationships of ecological processes, habitats, and species. For

example, the relationships among streamflow, storm events, flow-related shaping of river channels to modify habitat, and the physical and chemical signals that flow provides for aquatic species all need to be better understood.

Phasing is the logical sequence of implementing restoration actions to achieve CALFED goals as effectively as possible. Phasing will consider all targets and programmatic actions and will be used to prioritize actions. For example, actions directed at recovering endangered species and which are consistent with the long term restoration program and contribute to ecological resilience have a high priority. Early segments of the program will include restoration of ecological processes and habitats that are most important for endangered species recovery, reduction of stressors that affect threatened and endangered species, and other actions that may reduce conflicts between beneficial uses in the system. As restoration progresses and threats to endangered species are reduced or eliminated, restoration efforts can expand and focus on the broader issue of restoring ecological health.

The ERPP will be refined and implemented according to the steps listed below.

1. **Refine** the ERPP based on broad public participation, and using the best scientific knowledge currently available in the short term.

2. **Set the priority** for implementation and funding of ecosystem recovery projects based on a hierarchy designed to ensure the greatest level of ecosystem resilience against future disturbance, and to support self-sustaining populations that require the least amount of human intervention possible.
3. **Conduct immediate focused research** to improve understanding of the ecosystem and the causes of identified problems. Use results from short-term studies to adjust the way that objectives are achieved, making refinements to the final ERPP targets, actions, and implementation schedule.
4. **Develop and begin a phased implementation** program that entails:
 - short-term implementation of ecosystem restoration demonstration projects (e.g., through Category III and related programs), including stressor reduction measures, to help threatened populations begin recovering and to test the viability and effectiveness of targets and actions,
 - coordinated monitoring, evaluation, and reporting of the results of recovery efforts, and the status of ecological indicators in the Bay-Delta and other zones, and
 - adaptive management of each successive phase of ERPP implementation, including pragmatic adjustments to ecosystem targets, funding priorities, and restoration

techniques to ensure that public and private resources are well spent and complement other related efforts.

During refinement and implementation of the ERPP, public accountability and program effectiveness will be assured through continuing public involvement as well as environmental impact analysis and documentation.

TERMS USED IN THE ERPP

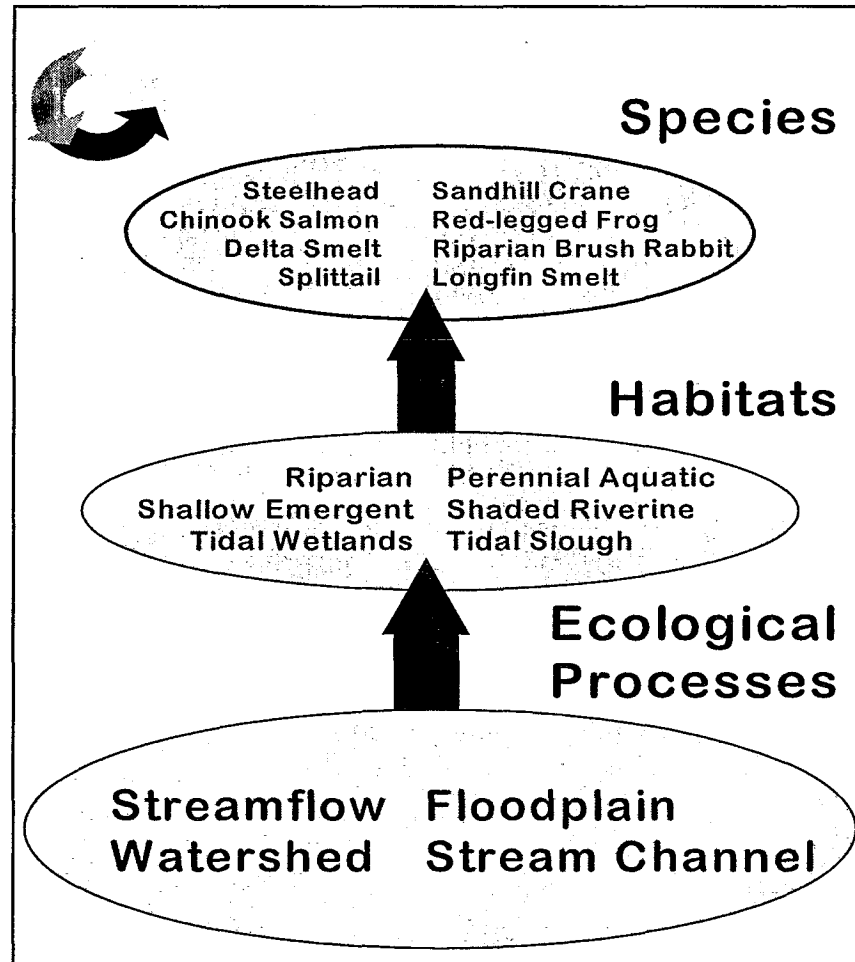
The following terms are used in the ERPP:

- **Ecosystem Element:** An ecosystem element is a basic component or function which, when combined with other ecosystem elements, make up an ecosystem. An ecosystem element can be categorized as a process, habitat, species, or species community.
- **Ecological Process:** Ecological processes act directly, indirectly, or in combination, to shape and form the ecosystem. These include streamflow, watershed, stream channel, and floodplain processes. Watershed processes are closely linked to streamflow and include fire and erosion. Stream channel processes include stream meander, gravel recruitment and transport, water temperature, and hydraulic conditions. Floodplain processes include overbank flooding and sediment retention and deposition.

- **Habitats:** Habitats are areas that provide specific conditions necessary to support plant, fish, and wildlife communities. Some important habitats include gravel bars and riffles for salmon spawning beds, winter seasonal floodplains that support juvenile fish and waterbirds, and shallow near-shore aquatic habitat shaded by overhanging tule marsh and riparian forest.
- **Species and Species Groups:** Certain species or groups of species are given particular attention in the ERPP. This focus is based on three criteria that might be met by a species: 1) it is threatened, endangered, or a species of special concern (e.g., delta smelt); 2) it is economically important, supporting a sport or commercial fishery (e.g., striped bass); or 3) it is an important prey species (e.g., Pacific herring).
- **Stressors:** Stressors are natural and unnatural events or activities that adversely affect ecosystem processes, habitats, and species. Environmental stressors include water diversions, water contaminants, levee confinement, stream channelization and bank armoring, mining and dredging in streams and estuaries, excessive harvest of fish and wildlife, introduced predator and competitor species, and invasive plants in aquatic and riparian zones. Some major stressors affecting the ecosystem are permanent features on the landscape, such as large dams and reservoirs that block transport of the natural supply of woody debris and sediment in rivers or alter unimpaired flows.

- **Vision:** A vision is what the ERPP will accomplish with the stated objectives, targets, and programmatic actions for an ecological process, habitat, species or species group, stressor, or geographical unit. The vision statements included in the ERPP provide extensive technical background to increase understanding of the ecosystem and its elements. Two types of vision statements are included in the ERPP: resource visions and ecological zone visions. A resource vision addresses an individual ecological processes, habitat, species or species group, or stressor, while an ecological zone vision addresses the integration of ecological processes, habitats, species, and stressors within a clearly delineated geographical area. Cumulatively, the visions also provide detailed descriptions of the ecosystem and its elements as they will look and function after restoration is accomplished.

The figure below portrays the relationship of ecological processes, habitats, and species.



- **Implementation Objective:** An implementation objective is the most specific and detailed description of what the ERPP strives to maintain or achieve for an ecosystem element. Implementation objectives are not intended to change over the life of the program.
- **Target:** A target is a qualitative or quantitative statement of an implementation objective. Targets are something to strive for but may change over the life of the program with new information and progress, or may vary according to the configuration of storage and conveyance in all alternatives. Targets may include a range of values or a narrative description of the proposed future value of an ecosystem element. Targets are to be set based upon realistic expectations, must be balanced against other resource needs and must be reasonable, affordable, cost effective, and practicably achievable.

The intent of the ERPP is to achieve ecosystem health; targets are flexible tools to guide the effort. The level of implementation for each target will be determined or adjusted through adaptive management. Targets are categorized according to the three levels of certainty described above: (1) targets that have sufficient certainty of success to justify full implementation in accordance with program priorities and phasing; (2) targets which will be implemented in stages with the appropriate monitoring and evaluation to judge benefits and successes; and (3) targets for which additional research,

demonstration and evaluations are needed to determine feasibility or ecosystem response.

- **Programmatic Action:** A programmatic action represents a physical, operational, legal, institutional change or alternative means to achieve a target. The number of actions and their level of implementation is subject to adjustment by adaptive management. For example, the number of diversions screened may be adjusted up or down depending on the overall response of fish populations to screening and other restoration actions.

INTRODUCTION TO SUMMARY TABLES

This executive summary contains nine tables that display in short form the draft ERPP visions, implementation objectives, and targets.

- **TABLE 1** summarizes the **resource vision statements** for critical ecological processes, habitats, important species, and stressors. These visions must be integrated throughout the Central Valley, Bay, and Delta to meet ERPP goals and objectives.
- **TABLES 2-10** summarize specific **restoration targets** for each of the 14 Ecological Zones. These targets are presented for each process, habitat, and stressor resource element in Table 1 and are presented with the program implementation

objectives they are designed to fulfil. Restoration targets for species and species groups are not included in Tables 2-10 at this time. Program emphasis is on restoration of ecological processes rather than single species. Restoration targets for species will be included to supplement other targets when the full draft ERPP is completed.

Targets presented in Tables 2-10 are classified by the use of diamond symbols which indicate the following target classifications:

- ◆ = Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response.
- ◆◆ = Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes.
- ◆◆◆ = Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 1. Summary of Ecosystem Visions.

Ecosystem Element	Vision Summary
Ecosystem Processes	
Central Valley Streamflows	Protect and enhance the ecological functions that are achieved through the multitude of physical and biological processes that operate within the stream channel and associated riparian and floodplain areas in order to contribute to the recovery of species and the overall health of the Bay-Delta.
Natural Sediment Supply	Provide a sustained supply of alluvial sediments that is transported by rivers and streams and distributed to floodplains, channel bars, riffles, shallow shoals, mudflats, and riverine bed deposits throughout the Sacramento-San Joaquin Valley, Delta, and Bay regions.
Natural Fluvial Geomorphology	Conserve and enhance the natural fluvial geomorphology of streams and rivers in order to contribute to and promote natural sediment transport and deposition.
Stream Meander Corridors	Conserve and reestablish stream meander corridors in order to create conditions which restore riverine and floodplain habitats for fish and wildlife.
Natural Floodplains and Flood Processes	Maintain or restore natural floodplains and the flood processes that sustain them in order to reestablish aquatic and terrestrial floodplain habitats.
Central Valley Stream Temperatures	Protect and improve the ecological functions that are achieved through the many physical, chemical, and biological processes that are regulated by water temperatures in order to provide suitable fish spawning, holding, and rearing habitat conditions.
Bay-Delta Hydraulics	Restore Bay-Delta channel hydraulics to conditions similar to those that occurred during the mid-1960s in order to provide migratory cues for aquatic species, provide transport flows for eggs, larvae and juvenile fish, and transport of sediments and nutrients.
Bay-Delta Aquatic Foodweb	Restore the Bay-Delta estuary's productive food base of aquatic algae and organic matter and the microbes and zooplankton that feed on these resources in order to support sustainable resources and higher trophic organisms.

Table 1. Continued.

Ecosystem Element	Vision Summary
Upper Watershed Health and Function	Reduce adverse affects of stressors such as wildfire, erosion, sedimentation, timber harvest, road construction, and water diversion in order to maintain watershed health and the ability to contribute to the health of the Bay-Delta ecosystem.

Habitats

Tidal Perennial Aquatic	Restore large areas of connecting waters associated with tidal emergent wetlands and supporting ecosystem processes in order to assist in the recovery of special-status fish populations and provide high quality aquatic habitat for other fish and wildlife dependent on the Bay-Delta.
Nontidal Perennial Aquatic	Increase the area of nontidal perennial aquatic habitat through creation of open water habitat as a component of saline and fresh emergent wetland restorations in order to provide high quality habitat for waterfowl and other water birds.
Delta Sloughs	Maintain and increase the area of high-quality interconnected dead-end and open-ended sloughs throughout the Delta similar to conditions in the early 1900s by restoring sloughs in order to assist in the recovery of special-status fish and wildlife populations, provide shallow-water habitats for fish spawning and rearing, and aquatic, wetland, and riparian habitat for wildlife.
Midchannel Islands and Shoals	Protect existing midchannel islands and shoals in order to provide high-quality habitat for fish and wildlife dependent on the Bay-Delta.
Saline Emergent Wetland	Protect existing saline emergent wetlands from degradation or loss and increase wetland habitat in order to assist in the recovery of special-status plant, fish, and wildlife populations and provide high quality habitat for other fish and wildlife dependent on the Bay-Delta.
Fresh Emergent Wetland	Protect existing fresh emergent wetlands from degradation or loss and increase wetland of habitat in order to assist in the recovery of special-status plant, fish, and wildlife populations, and provide high quality habitat for other fish and wildlife dependent on the Bay-Delta.

Table 1. Continued.

Ecosystem Element	Vision Summary
Seasonal Wetland	Improve the quality of seasonal wetlands by restoring ecosystem processes that sustain them and reduce the effect of stressors that can degrade the quality of seasonal wetlands in order to assist in the recovery of special-status plant and animal populations and provide high-quality habitat for waterfowl, water birds, and other wildlife dependent on the Bay-Delta.
Riparian and Riverine Aquatic Habitats	Protect and increase the area and quality of riparian and shaded riverine aquatic habitats and adjacent valley oak woodlands in order to assist in the recovery of special-status fish and wildlife populations and provide high-quality habitat for other fish and wildlife dependent on the Bay-Delta.
Inland Dune Scrub	Protect and enhance existing inland dune scrub habitat areas and restore former habitat areas in the Bay-Delta in order to provide high-quality habitat for associated special-status plant and animal populations.
Perennial Grassland	Protect and improve existing perennial grasslands and increase grassland area as a component of wetland and riparian habitat restorations in order to provide high quality habitat for special-status wildlife populations and other wildlife dependent on the Bay-Delta.
Agricultural Lands	Improve wildlife habitat values associated with agricultural lands in order to provide high-quality habitat for special-status wildlife populations and other wildlife dependent on the Bay-Delta.

Species and Species Groups

Delta Smelt	Ensure the recovery of this State- and federally listed threatened species in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of water in the Bay-Delta.
Longfin Smelt	Ensure the recovery of this species of special concern in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of water in the Bay-Delta.

Table 1. Continued.

Ecosystem Element	Vision Summary
Sacramento Splittail	Assist in the recovery of the of Sacramento splittail, a species proposed for listing under the federal Endangered Species Act (ESA) and a candidate for listing under the California ESA in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of water in the Bay-Delta.
White and Green Sturgeon	Restore the distribution and abundance of the white sturgeon to historical levels in order to support a sport fishery. Assist in the recovery of the green sturgeon, a Department of Fish and Game species of special concern, in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of water in the Bay-Delta.
Chinook Salmon	Contribute to the recovery of the Sacramento winter-run chinook salmon, a species listed as endangered under the federal and California ESAs in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of water in the Bay-Delta. Contribute to the restoration of Sacramento fall-run chinook, spring-run chinook , late-fall-run chinook, and San Joaquin fall-run chinook in order to support sport fisheries and viable commercial fisheries.
Steelhead Trout	Achieve naturally spawning steelhead trout populations of sufficient size to support inland recreational fishing and that fully use existing and restored habitat areas in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of water in the Bay-Delta.
Striped Bass	Restore striped bass to their 1960s levels of abundance in order to contribute to a recreational fishery in the Bay-Delta and to reduce conflict between protection for this species and other beneficial uses of water in the Bay-Delta.
American Shad	Maintain a naturally spawning American shad population that supports a sport fishery similar to the fishery that existed in the 1960s and 1970s in order to contribute to the recreational use of the Bay-Delta and to reduce conflict between protection for this species and other beneficial uses of water in the Bay-Delta.
Resident Fish Species	Maintain and restore the distribution and abundance of native fish species, such as Sacramento blackfish, hardhead, tule perch, and Sacramento perch, and non-native species, such as white catfish, largemouth bass, and threadfin shad to support a sport fishery and healthy forage populations.

Table 1. Continued.

Ecosystem Element	Vision Summary
Marine/Estuarine Fishes and Large Invertebrates	Maintain, improve, and restore populations to levels that existed in the early 1980s in order to contribute to the overall species richness and diversity and to reduce conflict between protection for these species and other beneficial uses of water in the Bay-Delta.
Western Spadefoot Toad and California Tiger Salamander	Assist in the recovery of these species of special concern in the Bay-Delta in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of water in the Bay-Delta.
California Red-Legged Frog	Assist in the recovery of this federally listed threatened species in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta.
Giant Garter Snake and Western Pond Turtle	Assist in the recovery of the giant garter snake, a federally listed threatened species, in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta. Assist in the recovery of the western pond turtle, a species of special concern, in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of water in the Bay-Delta.
Swainson's Hawk	Assist in the recovery of this State-listed threatened species in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta.
Clapper Rail	Assist in the recovery of this State- and federally listed endangered species in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta.
California Black Rail	Assist in the recovery of this State-listed threatened species in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta.

Table 1. Continued.

Ecosystem Element	Vision Summary
Greater Sandhill Crane	Assist in the recovery of this State-listed threatened species in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta.
Western Yellow-Billed Cuckoo	Assist in the recovery of this State-listed endangered species in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta.
Bank Swallow	Assist in the recovery of this State-listed threatened species in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta.
Suisun Song Sparrow	Assist in the recovery of this State- and federally listed endangered species in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta.
Salt Marsh Harvest Mouse	Assist in the recovery of this State- and federally listed endangered species in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta.
Riparian Brush Rabbit	Assist in the recovery of this State-listed endangered species in the Bay-Delta in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta.
Shorebird and Wading Bird Guild	Maintain healthy populations of shorebirds and wading birds in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta.
Waterfowl	Maintain healthy populations of waterfowl at levels that can support sport hunting and nonconsumptive uses.
Upland Game	Maintain healthy populations of upland game species at levels that can support sport hunting and nonconsumptive uses.

Table 1. Continued.

Ecosystem Element	Vision Summary
Neotropical Migratory Bird Guild	Maintain healthy populations of neotropical migratory birds in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta.
Lange's Metalmark, Delta Green Ground Beetle, and Valley Elderberry Longhorn Beetle	Assist in maintaining populations of the Lange's Metalmark, a federally listed endangered butterfly, by increasing its abundance in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of land water in the Bay-Delta. Assist in the recovery of the Delta Green Ground Beetle, a federally listed endangered species, by increasing its populations and abundance in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta. Assist in the recovery of the Valley Elderberry Longhorn Beetle, a federally listed threatened species, by increasing its populations and abundance in order to contribute to the overall species richness and diversity and to reduce conflict between protection for this species and other beneficial uses of land and water in the Bay-Delta.

Stressors

Water Diversions	Reduce the adverse effects of water diversions on aquatic organisms in order to minimize fish losses to assist in recovery of State- and federal listed fish species, important sport and commercial fisheries, and the Bay-Delta aquatic foodweb.
Dams, Reservoirs, Weirs, and Other Human-Made Structures	Reduce the adverse effects of dams, reservoirs, and other human-made structures on ecosystem processes and anadromous fish in order to assist in recovery of State- and federally listed fish species, and important sport and commercial fisheries.
Levees, Bridges, and Bank Protection	Reduce the adverse effects of levees, bridges, and bank protection in order to improve riverine and floodplain habitat conditions to assist in recovery of State- and federally listed fish species, important sport and commercial fisheries, and other fish and wildlife.
Dredging and Sediment Disposal	Reduce the adverse effects of dredging activities on the aquatic ecosystem in a manner consistent with the need to maintain channels for navigation, flood control, and water conveyance.

Table 1. Continued.

Ecosystem Element	Vision Summary
Gravel Mining and Recruitment	Reduce the adverse effects of instream gravel mining in order to improve gravel recruitment, cleansing, and transport by maintaining or restoring flood, floodplain, and streamflow processes that govern gravel supply.
Invasive Aquatic Plants	Reduce the adverse effects of invasive aquatic plants on native species and ecosystem processes, water quality and conveyance systems, and major rivers and their tributaries.
Invasive Riparian and Salt Marsh Plants	Reduce the adverse effects of invasive riparian and salt marsh plants on native species and ecosystem processes, water quality and conveyance systems, and major rivers and their tributaries.
Invasive Aquatic Organisms	Reduce the adverse effects of invasive non-native aquatic organisms on the foodweb and the adverse effects on native species resulting from competition for food and habitat and direct predation.
Non-Native Wildlife	Reduce the abundance of non-native wildlife species that through predation or competition threaten the diversity or abundance of native species, or the ecological stability of native habitats.
Predation and Competition	Reduce unnatural levels of predation and competition to the extent necessary to contribute to the rebuilding or restoration of important and valuable fish populations.
Contaminants	Ensure that all waters of mainstem rivers and tributaries entering the Bay-Delta, and all waters in the Bay-Delta, are free of toxic substances at loads and in concentrations that would compromise ecosystem functions, habitats, biological communities, or species, and the consumption of food species.
Wildfire	Reduce the acreage and frequency of catastrophic wildfires and the adverse effects of wildfire to fish and wildlife, and their habitats.
Harvest of Fish and Wildlife	Support fish and wildlife harvest strategies that are consistent with achieving recovery of special-status species and maintenance of healthy populations of other game fish and wildlife in order to contribute to the overall species richness and diversity and to reduce conflict between protection and uses for these species and other beneficial uses of water in the Bay-Delta.

Table 1. Continued.

Ecosystem Element	Vision Summary
Artificial Propagation of Fish	Manage artificial fish propagation programs consistent with rehabilitation of chinook salmon and steelhead stocks and the conservation of ecological and genetic values and to maintain the genetic diversity that exists between and within hatchery and naturally spawning populations.
Disturbance	Reduce the adverse effects of boating and other recreational activities, temporary habitat disturbances, and other activities on wildlife and their habitats in the Bay-Delta.

Table 2. Summary of Sacramento-San Joaquin Delta and Suisun Marsh/North San Francisco Bay Ecological Zone Targets.

Ecosystem Element	Sacramento-San Joaquin Delta Ecological Zone Targets	Suisun Marsh/North San Francisco Bay Ecological Zone Targets
<i>Implementation Objective: Restore basic features of the hydrograph in order to reactivate and maintain ecological processes and functions that create and maintain habitat required to sustain healthy fish, wildlife, and plant populations.</i>		
Central Valley Streamflows	<p>◆◆ Provide a March outflow that occurs from the natural late winter-early spring peak in inflow from the Sacramento River. The outflow should be at least 20,000 cfs for 10 days in dry years, at least 30,000 cfs for 10 days in below normal years, and 40,000 cfs for 10 days in above normal years.</p> <p>◆◆ Provide a late April-early May outflow that emulates the spring inflow from the San Joaquin River. The outflow should be at least 20,000 cfs for 10 days in dry years, 30,000 cfs for 10 days in below normal years, and 40,000 cfs for 10 days in above normal years.</p> <p>◆◆ Provide a fall or early winter outflow that emulates the first "winter" rain through the Delta.</p> <p>◆◆ Provide a minimum flow of 13,000 cfs on the Sacramento River below Sacramento in May of all but critical years.</p>	<p>◆◆ More closely emulate the natural pattern of seasonal freshwater inflow to North San Francisco Bay to transport sediments; allow upstream and downstream fish passage; contribute to riparian vegetation succession; permit transport of larval fish to the entrapment zone; maintain the entrapment zone in Suisun Bay; and provide adequate attraction flows for upstream, through-Bay migrating salmon. Delta outflow in dry and normal years will be improved by coordinating releases and natural flows in the Sacramento River to provide a March flow event of at least 20,000 cfs for 10 days in dry years, at least 30,000 cfs for 10 days in below normal years, and at least 40,000 cfs for 10 days in above normal years. The existing smaller, late-April and early-May flow event will be improved with additional releases of water from San Joaquin River and Delta tributaries to provide flows of magnitudes and durations similar to those prescribed for March.</p>

Notes: Target classification:

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Table 2. Continued.

Ecosystem Element	Sacramento-San Joaquin Delta Ecological Zone Targets	Suisun Marsh/North San Francisco Bay Ecological Zone Targets
<i>Implementation Objective: Modify channel and basin configurations in order to improve floodplain function along rivers and streams in the Sacramento-San Joaquin Basin.</i>		
Natural Flood and Floodplain Processes	◆◆ Expand the floodplain area in the North, East, South, and Central and West Delta ecological units by incorporating approximately 10 percent of leveed lands into the active floodplain of the Delta.	Not applicable.
<i>Implementation Objective: Maintain, improve, and restore water temperature regimes in order to meet life history needs of aquatic organisms.</i>		
Central Valley Stream Temperatures	◆ More frequently achieve mean daily water temperatures between 60°F and 65°F in the Delta channels in spring and fall consistent with temperature needs for salmon and steelhead migrating through or rearing in the Delta.	Not applicable.

Notes: Target classification:

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- ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes.
- ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 2. Continued.

Ecosystem Element	Sacramento-San Joaquin Delta Ecological Zone Targets	Suisun Marsh/North San Francisco Bay Ecological Zone Targets
<i>Implementation Objective: Establish and maintain an hydraulic regime in the Bay-Delta in order to provide for migratory cues, create and maintain habitat, and facilitate species distribution and transport.</i>		
Delta Channel Hydraulics	<p>◆◆◆ Reestablish more natural internal Delta hydraulics in channels not designated to carry cross-Delta flow of water to south Delta pumping plants.</p> <p>◆◆ Maintain net downstream flows in the mainstem San Joaquin River from Vernalis to immediately west of Stockton during September through November to sustain oxygen levels sufficient for upstream migrating adult fall-run chinook salmon.</p> <p>◆◆ Restore 50 to 100 miles of tidal channels in the southern Yolo Bypass within the North Delta Unit while maintaining or improving flood carrying capacity of the Yolo Bypass.</p>	Not applicable.
<i>Implementation Objective: Maintain, improve, or restore the amounts of basic nutrients available to the foodweb of estuarine and riverine systems in order to provide a desirable level of foodweb productivity.</i>		
Bay-Delta Aquatic Foodweb	◆◆ Increase primary and secondary productivity in the Delta to levels observed in the 1960s and early 1970s.	None developed.

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- ◆◆◆ = Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 2. Continued.

Ecosystem Element	Sacramento-San Joaquin Delta Ecological Zone Targets	Suisun Marsh/North San Francisco Bay Ecological Zone Targets
<i>Implementation Objectives: Increase the area of shallow-water and intertidal mudflat habitat in order to improve conditions which support increased primary and secondary productivity; provide rearing, foraging, and escape cover for fish; and provide foraging and resting habitat for waterbirds.</i>		
Tidal Perennial Habitat	<p>◆◆ Restore 1,500 acres of shallow-water habitat in the North Delta Ecological Unit; 1,000 acres of shallow-water habitat in the East Delta Ecological Unit; 2,000 acres of shallow-water habitat in the South Delta Ecological Unit; and 2,500 acres of shallow-water habitat in the Central and West Delta Ecological Unit.</p> <p>◆◆ Restore 500 acres of shoals in the western-most portion of the Central and West Delta.</p>	<p>◆◆ Restore 1,500 acres of shallow-water habitat in the Suisun Bay and Marsh Ecological Unit, and restore 1,000 acres of shallow-water habitat in the San Pablo Bay Ecological Unit.</p>

Notes: Target classification:

◆=Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆=Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆=Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 2. Continued.

Ecosystem Element	Sacramento-San Joaquin Delta Ecological Zone Targets	Suisun Marsh/North San Francisco Bay Ecological Zone Targets
<i>Implementation Objectives: Increase the area of nontidal perennial aquatic habitats in the Delta in order to provide improved foraging and resting habitat for waterbirds, particularly for diving ducks, and which will help to restore and maintain the ecological health of the terrestrial and aquatic resources in and dependent on the Delta.</i>		
Nontidal Perennial Aquatic Habitat	<p>◆◆ Develop 500 acres of deep open-water areas (greater than 4-6 feet deep) within restored fresh emergent wetland habitats in the Delta.</p> <p>◆◆ Develop 1,500 to 2,000 acres of shallow, open-water areas (<4-6 feet deep) in restored fresh emergent wetland habitat areas in the Delta.</p>	<p>◆◆ Develop 500 acres of deeper (3-6 feet deep) open-water areas in restored fresh emergent wetland habitats to provide resting habitat for water birds, foraging habitat for diving ducks and other water birds that feed in deep water, and habitat for associated resident fish species.</p>
<i>Implementation Objective: Protect and improve existing tidal slough habitat and restore a portion of the historical distribution of sloughs in the Bay-Delta within tidally influenced freshwater emergent wetlands, mudflats, and seasonal floodplains in order to restore and maintain the ecological health of the aquatic resources in and dependent on the Delta.</i>		
Delta Sloughs	<p>◆◆ Restore ecological functions and physical structure of the Delta waterways network by increasing the land-water interface ratio to a minimum of 50-75 percent compared to 1906 conditions and by restoring 100 to 150 miles of small distributary sloughs hydrologically connected to larger existing Delta channels.</p>	<p>◆◆ Restore slough habitat for fish and associated wildlife species. Restore 5 miles of slough habitat in the near term and 10 miles in the long term in the Suisun Bay and Marsh Ecological Unit; restore 10 miles in the short term and 20 miles in the long term in the San Pablo Bay, Napa River, Sonoma Creek, and Petaluma River Ecological Units.</p>

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Table 2. Continued.

Ecosystem Element	Sacramento-San Joaquin Delta Ecological Zone Targets	Suisun Marsh/North San Francisco Bay Ecological Zone Targets
<i>Implementation Objectives: Protect and enhance existing remnant channel islands in the Delta that have the highest value and greatest chance to be maintained by the restored streamflow patterns, hydraulic conditions, sediment transport, and other ecosystem processes and functions in order to restore and maintain the ecological health of the aquatic resources in and dependent on the Delta.</i>		
Midchannel Islands and Shoals	◆◆ Maintain existing channel islands and restore 50-200 acres of high value islands in selected sloughs and channels in each of the Delta's ecological units (200 to 800 acres total).	Not applicable.
<i>Implementation Objective: Increase the area of saline emergent wetlands to provide high-quality habitat for waterfowl, shorebirds, and other associated wildlife; provide rearing habitat, foraging habitat, and escape cover for fish; and expand the populations and range of associated special-status and listed plant and animal species.</i>		
Saline Emergent Wetland Habitat	Not applicable.	◆◆ Restore tidal action to 5,000-7,000 acres in the Suisun Bay and Marsh Ecological Unit; 1,000-2,000 acres in the Napa River Ecological Unit; 500-1,000 acres each in the Sonoma Creek, Petaluma River, and San Pablo Bay Ecological Units.

Notes: Target classification:

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- ◆◆◆ = Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 2. Continued.

Ecosystem Element	Sacramento-San Joaquin Delta Ecological Zone Targets	Suisun Marsh/North San Francisco Bay Ecological Zone Targets
<i>Implementation Objective: Increase the area of fresh emergent wetland by restoring tidally influenced fresh emergent wetland in the Delta to provide high-quality habitat for waterfowl, shorebird, and other associated wildlife, providing rearing, foraging, and escape cover for fish; and expanding the populations an range of special-status and listed plant and animal species to assist in their eventual recovery.</i>		
Fresh Emergent Wetland Habitat	<p>◆ Increase existing tidal emergent wetland habitat in the Delta by restoring 30,000-45,000 acres to tidal influence.</p> <p>◆◆ Restore 1,000 acres of nontidal fresh emergent wetland in both the North and East Delta Ecological Units; restore 4,000 acres of nontidal fresh emergent wetland in the South Delta Ecological Unit as part of a subsidence control program; and restore 10,000 acres of nontidal emergent wetland in the Central and West Delta Ecological Unit as part of a subsidence program.</p>	None developed.

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Table 2. Continued.

Ecosystem Element	Sacramento-San Joaquin Delta Ecological Zone Targets	Suisun Marsh/North San Francisco Bay Ecological Zone Targets
<i>Implementation Objective: Restore and manage seasonal wetland habitat in the Delta to restore and maintain the ecological health of the aquatic resources in and dependent on the Delta; restore foodweb and floodplain processes; reduce the effects of contaminants and water management on the Delta's aquatic resources; and provide high-quality foraging and resting habitat for wintering waterfowl, greater sandhill cranes, and migratory and wintering shorebirds.</i>		
Seasonal Wetland Habitat	◆◆ Restore and manage at least 4,000 acres of additional seasonal wetland habitat and improve management of 1,000 acres of existing, degraded seasonal wetland habitat in the North Delta Ecological Unit; restore and manage at least 6,000 acres of additional seasonal wetland habitat and improve management of 1,000 acres of existing degraded seasonal wetland habitat in the East Delta Ecological Unit; restore and manage at least 8,000 acres of additional seasonal wetland habitat and improve management of 1,500 acres of existing, degraded seasonal wetland habitat in the Central and West Delta Ecological Unit; restore and manage at least 12,000 acres of additional seasonal wetland habitat and improve management of 500 acres of existing, degraded seasonal wetland habitat in the South Delta Ecological Unit.	◆◆ Restore and manage 3,000 acres of additional seasonal wetland habitat and improve management of 1,000 acres of existing, degraded seasonal wetland habitat in the Suisun Bay and Marsh Ecological Unit. Restore and manage 2,000 acres of additional seasonal wetland habitat and improve management of 1,000 acres of degraded seasonal wetland habitat in the San Pablo Bay Ecological Unit. ◆◆◆ Protect and manage 500 to 1,000 acres of vernal pools in the Suisun Bay and Marsh Ecological Unit that provide suitable habitat for listed fairy shrimp species, the Delta green ground beetle, and special-status plant species to assist in the recovery of those species.

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Table 2. Continued.

Ecosystem Element	Sacramento-San Joaquin Delta Ecological Zone Targets	Suisun Marsh/North San Francisco Bay Ecological Zone Targets
<i>Implementation Objective: Restore riparian scrub, woodland, and forest habitat along largely unvegetated riprapped banks of Delta island levees, along the Sacramento and San Joaquin Rivers, and along major tributaries of the Sacramento and San Joaquin Rivers in order to create corridors of riparian vegetation to provide shaded riverine aquatic cover for anadromous and other fish species, and to create high-quality habitat for associated special-status plant and animal species, and other associated wildlife.</i>		
Riparian and Riverine Aquatic Habitat	<p>◆◆ Restore 10-20 linear miles along the San Joaquin River and in the South Delta Ecological Unit to create corridors of riparian vegetation of which 50 percent is greater than 75 feet in width and 40 percent is no less than 300 feet wide and 1 mile in length. Restore 15-25 linear miles along other Delta island levees throughout the South Delta Ecological Unit to create corridors of riparian vegetation of which 60 percent is more than 75 feet wide, with 10 percent not less than 300 feet wide and 1 mile long.</p> <p>◆◆ Protect existing riparian woodlands in the North, East, and South Delta Ecological Units.</p>	<p>◆◆ Restore 10 to 15 linear miles of riparian and shaded riverine aquatic habitat along corridors of riparian scrub and shrub vegetation each in the Suisun Marsh and Bay, Napa River, Sonoma Creek, and Petaluma River ecological units, of which 60 percent is more than 15 years wide and 25 percent is no less than 5 yards wide and 1 mile long.</p>
<i>Implementation Objective: Improve low- to moderate-quality Antioch inland dune habitat in the Delta in order to provide high-quality habitat for special-status plant and animal species and other associated wildlife populations.</i>		
Island Dune Scrub	<p>◆◆ Improve 50-100 acres of low- to moderate-quality Antioch inland dune scrub habitat.</p>	Not applicable.

Notes: Target classification:

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Table 2. Continued.

Ecosystem Element	Sacramento-San Joaquin Delta Ecological Zone Targets	Suisun Marsh/North San Francisco Bay Ecological Zone Targets
<i>Implementation Objective: Preserve and restore perennial grassland habitat in conjunction with restoration of floodplain riparian and valley oak habitats in order to provide high-quality habitat conditions for associated special-status plant species and wildlife.</i>		
Perennial Grassland	◆◆ Restore 4,000 to 6,000 acres of perennial grassland in the North, East, and South Delta Ecological Units associated with existing or proposed wetlands and floodplain habitats.	◆◆ Restore 1,000 acres of perennial grassland each in the Suisun Marsh and Bay, Napa River, Petaluma River, and Sonoma Creek ecological units in association with existing or proposed wetlands.
<i>Implementation Objective: Co-manage agricultural upland and wetland habitat in order to provide wildlife forage and resting area habitat values for wintering and migrating waterfowls, shorebirds, and other associated wildlife in the Delta.</i>		
Agricultural Lands	Manage 40,000 to 75,000 acres of agricultural lands to maintain and improve wildlife habitat values.	◆◆ Manage 5,000 to 10,000 acres of agricultural lands to maintain and improve wildlife habitat values.
<i>Implementation Objective: Reduce entrainment of aquatic organisms and nutrients at to increase survival of juvenile fish and maintain foodweb.</i>		
Water Diversions	◆◆ Reduce loss of important fish at diversions.	◆◆ Reduce entrainment losses of juvenile fish at agricultural, power plant, and managed wetland diversions by 25-50 percent.

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Table 2. Continued.

Ecosystem Element	Sacramento-San Joaquin Delta Ecological Zone Targets	Suisun Marsh/North San Francisco Bay Ecological Zone Targets
<i>Implementation Objective: Reestablish natural vegetation along artificially confined channel reaches, consistent with flood protection needs and new levee vegetation management guidelines approved by the Reclamation Board.</i>		
Levees, Bridges, and Bank Protection	◆◆ Increase shoreline and floodplain riparian habitat in the Delta by modifying current vegetation management practices on both the water and land side of berms on 25-75 miles of the Sacramento, Mokelumne, and San Joaquin rivers, and on 25-100 miles of other Delta channels and sloughs confined by levees	None developed.
<i>Implementation Objective: Reduce loss and degradation of important aquatic habitat and vegetated berm islands caused by dredging activities. Reduce impacts of dredging activities on aquatic resources during key spawning and rearing periods and in sensitive areas for aquatic resources to protect, restore, and maintain the health of aquatic resources in and dependent on the Delta.</i>		
Dredging and Sediment Disposal	◆◆ Limit dredging in channel zones that are not essential for flood conveyance or maintenance of industrial shipping pathways, and avoid dredging activities in shallow water areas except where it is needed to restore flood conveyance capacity. ◆◆ Avoid dredging during spawning and rearing periods for delta smelt and rearing periods for winter-run chinook salmon.	None developed.

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Table 2. Continued.

Ecosystem Element	Sacramento-San Joaquin Delta Ecological Zone Targets	Suisun Marsh/North San Francisco Bay Ecological Zone Targets
<i>Implementation Objective: Reduce adverse effects of invasive non-native aquatic plants to increase and maintain the productivity of the aquatic foodweb, preserve suitable fish habitat structure, and provide quality habitat conditions for native submergent and emergent plants.</i>		
Invasive Aquatic Plants	<p>◆◆ Manage existing and restored dead-end and open-ended sloughs and channels so that less than 1 percent of the surface area of these sloughs and channels are covered by invasive non-native aquatic plants.</p> <p>◆ Reduce the potential for introduction of non-native aquatic plant and animal species at border crossings.</p>	<p>◆◆ Manage existing and restored dead-end and open-ended sloughs and channels so that less than 1 percent of the surface area of these sloughs and channels are covered by invasive non-native aquatic plants.</p> <p>◆ Reduce the potential for introduction of non-native aquatic plant and animal species at border crossings.</p>
<i>Implementation Objective: Reduce populations of invasive non-native tree and shrub species that compete with the establishment and succession of native riparian vegetation.</i>		
Invasive Riparian and Salt Marsh Plants	<p>◆ Reduce surface area covered by exotic plants to less than 1 percent.</p> <p>◆◆ Reduce the invasive non-native woody species, such as giant reed (<i>Arundo</i> or false bamboo) and eucalyptus, that compete with native riparian vegetation by reducing the areal extent of exotics by 50 percent.</p>	<p>◆◆ Reduce the area covered by invasive non-native woody species, such as giant reed and eucalyptus, that compete with native riparian vegetation by reducing the areal extent of exotics by 50 percent, and eradicate invasive woody plants from restoration areas.</p>

Notes: Target classification:

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Table 2. Continued.

Ecosystem Element	Sacramento-San Joaquin Delta Ecological Zone Targets	Suisun Marsh/North San Francisco Bay Ecological Zone Targets
<i>Implementation Objective: Reduce introductions of non-native aquatic organisms that compete or displace native species.</i>		
Invasive Aquatic Organisms	◆◆ Reduce or eliminate the introduction of non-native species from ship ballast water.	◆◆ Reduce or eliminate the introduction of non-native species from ship ballast water.
<i>Implementation Objective: Reduce the loss of juvenile anadromous and resident fish and other aquatic organisms from unnatural levels of predation in order to increase survival and contribute to the restoration of important species.</i>		
Predation and Competition	◆◆◆ Reduce predation on juvenile fish in Clifton Court Forebay.	None developed.
<i>Implementation Objective: Reduce concentrations and loadings of contaminants in the aquatic environment and the subsequent bioaccumulation by aquatic species in order to increase survival and eliminate public health concerns.</i>		
Contaminants	◆◆ Reduce loading, concentrations, bioaccumulation of contaminants in tissues of fish and wildlife of concern by 25 to 50 percent as measured against current average levels, and the accumulation in the water and sediments in the Delta Ecological Zone.	◆◆ Reduce the input of herbicides, pesticides, fumigants, and other agents toxic to fish and wildlife.

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Table 2. Continued.

Ecosystem Element	Sacramento-San Joaquin Delta Ecological Zone Targets	Suisun Marsh/North San Francisco Bay Ecological Zone Targets
<i>Implementation Objective: Reduce the current level of harvest of fish and wildlife in order to restore and maintain the ecological health of the aquatic resources and wildlife in and dependent on the Delta.</i>		
Harvest of Fish and Wildlife	◆ Reduce illegal harvest of wildlife and anadromous fish in the Delta.	◆ Reduce illegal harvest of anadromous fish and waterfowl in the Suisun Marsh and North San Francisco Bay.
<i>Implementation Objective: Reduce the potentially adverse effects of stocking artificially produced fish throughout Central Valley rivers and streams in order to increase the survival of naturally produced fish and contribute to long-term restoration goals.</i>		
Artificial Production of Fish	None developed.	◆◆ Limit supplementation of striped bass to life stages and numbers that minimize the rate of predation on juvenile anadromous and estuarine fish.
<i>Implementation Objective: Reduce human activities that adversely affect wildlife behavior or cause habitat destruction in order to increase spawning success and contribute to restoration of important species.</i>		
Disturbance	◆◆◆ Reduce boat traffic and boat speeds in areas where levees or channel islands and their associated shallow water and riparian habitat are susceptible to wake damage.	◆◆◆ Reduce boat wakes near California clapper and black rail nesting areas in Suisun Marsh and San Francisco Bay from March to June to prevent destruction of nests and to assist in the recovery of these listed species.

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Table 3. Summary of Sacramento River, American River Basin, San Joaquin River, and West San Joaquin Basin Ecological Zone Targets.

Ecosystem Element	Ecological Zone			
	Sacramento River Targets	American River Basin Targets	San Joaquin River Targets	West San Joaquin Basin Targets
<i>Implementation Objective: Restore basic features of the hydrograph in order to reactivate and maintain ecological processes and functions which create and maintain habitat required to sustain healthy fish, wildlife, and plant populations.</i>				
Central Valley Streamflows	<p>◆◆ Allow a 5,000-10,000 cfs 10-day flow event in March during dry years and provide a 15,000-20,000 cfs 10-day flow event in March during below normal and above normal water years.</p> <p>◆◆ Allow a 6,000-8,000 cfs base flow in fall.</p>	<p>◆◆ Allow monthly base flows of 500 to 1,500 cfs during critical relaxation: 500 to 2,000 cfs in dry and critical years: 1,500 to 3,000 in above normal; and 2,500 to 4,500 cfs in wet years.</p> <p>◆◆ Allow a 10-day flow event in March, April, or May as follows: 3,000-4,000 cfs (dry years), 4,000-6,000 cfs (above-normal) 6,000-8,000 cfs (wet years).</p>	<p>◆ Manage flow releases from tributary streams to provide adequate upstream and downstream passage of fall-run and late-fall-run chinook salmon, rainbow trout, and steelhead, and provide spawning and rearing habitat for American shad, splittail, and sturgeon from the Merced River confluence to Vernalis.</p> <p>◆ Manage flow releases from Friant Dam to Gravelly Ford for maintenance of resident native fishes.</p>	<p>◆ Maintain flow to sustain ecological processes, support wetland and riparian systems, and dilute contaminants.</p>

Notes: Target classification:

◆ = Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ = Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ = Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 3. Continued.

Ecosystem Element	Ecological Zone			
	Sacramento River Targets	American River Basin Targets	San Joaquin River Targets	West San Joaquin Basin Targets
Central Valley Streamflows (continued)		◆◆◆ Minimize changes in seasonal flow below Nimbus Dam that reduce survival of juvenile anadromous fish		
<i>Implementation Objective: Establish an adequate sediment supply to riverine and estuarine systems in order to restore or reactivate stream channel meander, point bar formation, provide sediments to rebuild wetlands and shallow water habitats, and provide for nutrient transport.</i>				
Natural Sediment Supply	◆◆ Increase gravel recruitment by 10,000-20,000 cubic yards annually to provide adequate spawning habitat for targeted levels of salmon and steelhead and to sustain stream meander processes below Red Bluff.	◆◆ Maintain and improve gravel recruitment or supplement gravel in the lower American River, consistent with flood control capacity, by annually providing 6,000-10,000 cubic yards of gravel to the active stream channel.	◆ Restore balanced fine sediment regime, maintaining fine sediment input in balance with transport from the system.	Not applicable.

Notes: Target classification:

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Table 3. Continued.

Ecosystem Element	Ecological Zone			
	Sacramento River Targets	American River Basin Targets	San Joaquin River Targets	West San Joaquin Basin Targets
<i>Implementation Objective: Maintain, improve, or restore natural stream meander processes in order to allow the natural recruitment of sediments, create habitats, and promote natural riparian succession processes.</i>				
Stream Meander Corridors	◆◆ Preserve and improve the existing stream meander belt in the Sacramento River between Red Bluff and Chico Landing by acquiring 8,000-12,000 acres of riparian lands in meander belt.	None developed.	◆◆ Restore the defined floodplain and reestablish stream meander zone on the San Joaquin River between Vernalis and the mouth of the Merced River.	◆ Restore 10 to 25 miles of stream channel, stream meander belts, and floodplain processes along west side tributaries.
<i>Implementation Objective: Modify channel and basin configurations in order to improve floodplain function along rivers and streams in the Sacramento-San Joaquin Basin.</i>				
Natural Floodplain and Flood Processes	◆◆ Increase and maintain floodplains in conjunction with stream meander corridor restoration.	◆◆◆ Maintain the existing floodplain along the American River between Nimbus Dan and the Sacramento River that emulates a natural stream channel meander configuration.	None developed.	◆ Expand existing floodplain overflow basins.

Notes: Target classification:

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Table 3. Continued.

Ecosystem Element	Ecological Zone			
	Sacramento River Targets	American River Basin Targets	San Joaquin River Targets	West San Joaquin Basin Targets
<i>Implementation Objective: Maintain, improve, and restore water temperature regimes in order to meet life history needs of aquatic organisms.</i>				
Central Valley Stream Temperatures	<p>◆◆◆ Maintain mean daily water temperatures at levels suitable for maintenance of chinook salmon and steelhead between Keswick Dam and Red Bluff Diversion Dam.</p>	<p>◆◆◆ Maintain temperatures of 60°F or less beginning in mid- to late October for chinook salmon and steelhead spawning.</p> <p>◆ Provide a mean daily water temperature of 61-65°F for at least two weeks between May 15 and June 30 for American shad spawning.</p> <p>◆ Provide water that is 65°F or cooler for oversummer rearing of steelhead in the lower American River.</p>	<p>◆◆ Manage reservoir releases and other factors to provide suitable water temperatures for important resources between the Merced River confluence and Vernalis.</p>	Not applicable.

Notes: Target classification:

◆ =Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 3. Continued.

Ecosystem Element	Ecological Zone			
	Sacramento River Targets	American River Basin Targets	San Joaquin River Targets	West San Joaquin Basin Targets
<i>Implementation Objective: Restore ecological processes in the upper watershed that affect the quality and quantity of water in the Bay-Delta, rivers, and tributaries.</i>				
Upper Watershed Health and Function	None developed.	◆ Restore upper watershed processes.	None developed.	None developed.
<i>Implementation Objective: Increase the area of shallow (>3 feet) open-water habitat in the Delta to order to provide resting, foraging, and brood habitat for waterbirds and habitat for fish and aquatic plants and animals.</i>				
Nontidal Perennial Aquatic Habitat	None developed.	None developed.	None developed.	◆ Restore 1,000 acres of perennial aquatic habitat within and adjacent to existing wetlands.

Notes: Target classification:

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Table 3. Continued.

Ecosystem Element	Ecological Zone			
	Sacramento River Targets	American River Basin Targets	San Joaquin River Targets	West San Joaquin Basin Targets
<i>Implementation Objective: Increase the area of tidal shallow-water and mudflat habitat in order to provide foraging and resting habitat for waterbirds and rearing, foraging, and escape cover for fish and associated wildlife.</i>				
Seasonal Wetland Habitat	None developed.	None developed.	None developed.	<p>◆ Restore and manage 2,000 acres of additional seasonal wetland habitat.</p> <p>◆ Improve management of 1,000 acres of existing degraded seasonal wetlands.</p>

Notes: Target classification:

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Table 3. Continued.

Ecosystem Element	Ecological Zone			
	Sacramento River Targets	American River Basin Targets	San Joaquin River Targets	West San Joaquin Basin Targets
<i>Implementation Objective: Restore riparian scrub, woodland, and forest habitat along largely unvegetated riprapped banks of Delta island levees, along the Sacramento and San Joaquin Rivers, and along major tributaries of the Sacramento and San Joaquin Rivers in order to create corridors of riparian vegetation that provide shaded riverine aquatic cover for anadromous and other fish species; and to create high-quality habitat for associated special-status plant and animal species, and other associated wildlife.</i>				
Riparian and Riverine Aquatic Habitats	<p>◆◆ Provide conditions for growth of riparian vegetation along channelized portions of the Sacramento River.</p> <p>◆◆ Increase the ecological value of low- to moderate-quality SRA habitat.</p> <p>◆◆◆ Maintain existing riparian vegetation.</p>	◆◆ Provide a sustainable corridor of riparian habitat along the entire length of the lower American River.	◆ Restore 50 stream miles of self-sustaining diverse riparian community.	◆ Restore 500 to 1,000 acres of riparian forest.

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Table 3. Continued.

Ecosystem Element	Ecological Zone			
	Sacramento River Targets	American River Basin Targets	San Joaquin River Targets	West San Joaquin Basin Targets
<i>Implementation Objective: Reduce entrainment of juvenile fish into water diversions by screening or consolidating diversions or by altering diversion timing in order to increase survival and cohort replacement levels.</i>				
Water Diversion	<p>◆◆ Reduce entrainment of juvenile salmon and steelhead into water diversions to levels that will not impair chinook salmon or steelhead stock rebuilding.</p> <p>◆◆ Upgrade fish passage facilities at the Anderson-Cottonwood Irrigation District and Red Bluff Diversion dams.</p>	<p>◆◆ Improve survival of juvenile anadromous fish from the adverse effects of diverting water from the lower American River below Folsom Dam.</p>	<p>◆◆ Reduce entrainment of juvenile fish and other aquatic organisms into diversions by 50 percent from Merced River confluence to Vernalis.</p> <p>◆◆◆ Eliminate the loss of adult fall-run chinook salmon straying into the San Joaquin River upstream from the Merced River confluence.</p>	Not applicable.

Notes: Target classification:

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Table 3. Continued.

Ecosystem Element	Ecological Zone			
	Sacramento River Targets	American River Basin Targets	San Joaquin River Targets	West San Joaquin Basin Targets
<i>Implementation Objective: Reestablish or reactivate geomorphological processes in artificially confined channel reaches in order to maintain hydrologic connectivity with natural floodplain.</i>				
Levees, Bridges, and Bank Protection	◆◆ Construct setback levees along leveed reaches of the river as part of the stream meander corridor element.	None developed.	◆◆ Set back 10 miles of levees along the San Joaquin River between the Merced River confluence and Vernalis, where feasible, to reestablish the hydrologic connectivity between these channels and natural floodplains.	None developed.

Notes: Target classification:

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Table 3. Continued.

Ecosystem Element	Ecological Zone			
	Sacramento River Targets	American River Basin Targets	San Joaquin River Targets	West San Joaquin Basin Targets
<i>Implementation Objective: Reduce the loss of juvenile anadromous and resident fish and other aquatic organisms from unnatural levels of predation in order to increase survival and contribute to the restoration of important species.</i>				
Predation and Competition	◆ Reduce the adverse effects of predatory fish by identifying and eliminating humanmade instream structures or operational conditions that allow unnatural rates of predation.	None developed.	None developed.	Not applicable.
<i>Implementation Objective: Reduce concentrations and loadings of contaminants in the aquatic environment and the subsequent bioaccumulation by aquatic species in order to increase survival and eliminate public health concerns.</i>				
Contaminants	◆ Reduce losses of fish and wildlife resulting from pesticide, hydrocarbon, heavy metal and other pollutants.	Not applicable.	◆ Reduce losses of fish and wildlife due to pesticide, hydrocarbon, heavy metal, and other pollutant use in the basin.	◆ Reduce the application of herbicides, pesticides, fumigants, and other agents toxic to fish and wildlife on 20,000 acres of agricultural lands with the greatest risk to fish and wildlife populations.

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Table 3. Continued.

Ecosystem Element	Ecological Zone			
	Sacramento River Targets	American River Basin Targets	San Joaquin River Targets	West San Joaquin Basin Targets
<i>Implementation Objective: Reduce the level or incidence of harvest of wild, naturally produced Bay-Delta fish populations and focus harvest on hatchery produced fish in order to protect and increase the productive potential of wild fish populations.</i>				
Harvest of Fish and Wildlife	<p>◆◆ Reduce illegal harvest of fish species to a minimum to maintain or increase populations by increasing enforcement efforts by 50%.</p> <p>◆◆ Manage the legal harvest of chinook salmon, steelhead, and sturgeon by shifting harvest from natural stocks to hatchery-reared stocks where possible or reducing harvest of wild stocks until the naturally produced populations recover.</p>	<p>◆◆ Develop harvest management strategies that provide spawning adult abundance at levels to fully utilize existing and restored habitat and focus harvest on hatchery-produced fish.</p>	None developed.	Not applicable.

Notes: Target classification:

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Table 3. Continued.

Ecosystem Element	Ecological Zone			
	Sacramento River Targets	American River Basin Targets	San Joaquin River Targets	West San Joaquin Basin Targets
<i>Implementation Objective: Protect and restore the genetic diversity of naturally producing populations of chinook salmon and steelhead to sustain long-term viability of the populations.</i>				
Artificial Propagation of Fish	<p>◆◆ Minimize the likelihood that hatchery-reared chinook salmon and steelhead in the upper Sacramento River will stray into non-natal streams to protect naturally produced chinook salmon and steelhead.</p> <p>◆◆ Limit hatchery stocking to populations that cannot be sustained through natural production.</p> <p>◆◆ Employ methods to limit straying and loss of genetic integrity of wild and hatchery supported stocks.</p>	<p>◆◆ Minimize the likelihood that hatchery-reared chinook salmon and steelhead will stray into non-natal streams to protect naturally produced chinook salmon and steelhead.</p> <p>◆◆ Limit hatchery stocking if populations can be sustained through natural production.</p> <p>◆◆ Minimize further threats of hatchery fish contaminating wild stocks of chinook salmon.</p>	None developed.	None developed.

Notes: Target classification:

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Table 3. Continued.

Ecosystem Element	Ecological Zone			
	Sacramento River Targets	American River Basin Targets	San Joaquin River Targets	West San Joaquin Basin Targets
Artificial Propagation of Fish (continued)	◆◆ Minimize further threats of hatchery fish contaminating wild stocks of chinook salmon and steelhead.			

Notes: Target classification:

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Table 4. Summary of North Sacramento Valley and Cottonwood Creek Ecological Zone Targets.

Ecosystem Element	North Sacramento Valley Ecological Zone				Cottonwood Creek Ecological Zone Targets
	Clear Creek Targets	Cow Creek Targets	Bear Creek Targets	Battle Creek Targets	
Implementation Objective: Restore basic features of the hydrograph in order to reactivate and maintain ecological processes and functions that create and maintain habitat required to sustain healthy fish, wildlife, and plant populations.					
Central Valley Streamflows	<p>◆◆ Allow 150-200 cfs below Whiskeytown Dam from October 1 to May 30.</p> <p>◆◆ Allow 100-150 cfs below Whiskeytown Dam from June 1 to September 30.</p>	<p>◆ Increase flow by 25-50 cfs and maintain 25-75 cfs during October.</p>	<p>◆ Increase base flow by 10-20 cfs.</p>	<p>◆◆ Increase base flow by 25-50 cfs.</p>	<p>◆ During the summer and fall, more closely emulate the seasonal streamflow pattern so that flows are sufficient for holding and spawning in most year types. Provide up to 20-50 cfs that mobilize and transport sediments, allow upstream fish passage, create point bars, and contribute to stream channel meander and riparian succession.</p>

Notes: Target classification:

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Table 4. Continued.

Ecosystem Element	North Sacramento Valley Ecological Zone				Cottonwood Creek Ecological Zone Targets
	Clear Creek Targets	Cow Creek Targets	Bear Creek Targets	Battle Creek Targets	
Implementation Objective: Establish an adequate sediment supply to riverine and estuarine systems in order to restore or reactivate stream channel meander, point bar formation, provide sediments to rebuild wetlands and shallow water habitats, and provide for nutrient transport.					
Natural Sediment Supply	◆◆ Increase existing levels of erosion and gravel recruitment in Clear Creek by 25-50 tons per year.	◆◆ Increase existing levels of erosion and gravel recruitment in Cow Creek by 5-10 tons per year.	None developed.	None developed.	◆◆◆◆ Maintain existing levels of erosion and gravel recruitment in streams in the Cottonwood Creek Ecological Zone and provide for increasing the transport of these sediments to the Sacramento River by an average of 30,000 to 40,000 tons per year.

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Table 4. Continued.

Ecosystem Element	North Sacramento Valley Ecological Zone				Cottonwood Creek Ecological Zone Targets
	Clear Creek Targets	Cow Creek Targets	Bear Creek Targets	Battle Creek Targets	
Natural Sediment Supply (continued)					◆◆ Restore and rehabilitate spawning gravels in 10-20 miles of the lower South Fork and mainstem of Cottonwood Creek
<i>Implementation Objective: Maintain, improve, or restore natural stream meander processes in order to allow the natural recruitment of sediments, create habitats, and promote natural riparian succession processes.</i>					
Stream Meander Corridors	◆◆ Restore channel meander in lower 8 miles of Clear Creek.	None developed.	None developed.	None developed.	◆ Preserve or restore the 50-100 year floodplain and existing stream channel meander characteristics, particularly in the low gradient areas throughout the lower 20 miles where most deposition occurs and where stream meander is most pronounced.

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Table 4. Continued.

Ecosystem Element	North Sacramento Valley Ecological Zone				Cottonwood Creek Ecological Zone Targets
	Clear Creek Targets	Cow Creek Targets	Bear Creek Targets	Battle Creek Targets	
Implementation Objective: Modify channel and basin configurations in order to improve floodplain function along rivers and streams in the Sacramento-San Joaquin basin.					
Natural Flood and Floodplain Processes	None developed.	None developed.	None developed.	None developed.	◆◆ Reestablish sediment deposition in the floodplain.
Implementation Objective: Restore ecological processes in the upper watershed that affect the quantity and quality of water in the Bay-Delta, rivers, and tributaries.					
Upper Watershed Health and Function	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.

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Table 4. Continued.

Ecosystem Element	North Sacramento Valley Ecological Zone				Cottonwood Creek Ecological Zone Targets
	Clear Creek Targets	Cow Creek Targets	Bear Creek Targets	Battle Creek Targets	
<i>Implementation Objective: Restore riparian scrub, woodland, and forest habitat along largely unvegetated riprapped banks of Delta island levees, along the Sacramento and San Joaquin Rivers, and along major tributaries of the Sacramento and San Joaquin Rivers in order to create corridors of riparian vegetation that provide shaded riverine aquatic cover for anadromous and other fish species; and to create high-quality habitat for associated special-status plant and animal species, and other associated wildlife.</i>					
Riparian and Riverine Aquatic Habitat	None developed.	None developed.	None developed.	None developed.	◆◆ Develop a cooperative program to establish a continuous 130-mile riparian habitat zone along upper and lower Cottonwood Creek and its tributaries through conservation easement, fee acquisition, or voluntary landowner measures.

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Table 4. Continued.

Ecosystem Element	North Sacramento Valley Ecological Zone				Cottonwood Creek Ecological Zone Targets
	Clear Creek Targets	Cow Creek Targets	Bear Creek Targets	Battle Creek Targets	
Implementation Objective: Increase the connection of upstream spawning and rearing habitats with the mainstem rivers in the Sacramento-San Joaquin basin in order to increase success of adult spawners and survival of juvenile downstream migrants.					
Dams, Reservoirs, Weirs, and Other Human-Made Structures	◆◆ Work with landowners and diverters on Clear Creek to improve fish passage between its mouth and Whiskeytown Dam.	◆◆ Work with landowners and diverters on Cow Creek to reduce the adverse effects of 13 seasonal diversion dams in South Cow Creek, 10 diversion dams in Old Cow Creek, two diversion dams in Clover Creek that are barriers to migrating chinook salmon and steelhead to allow access to 100 percent of the habitat below any natural bedrock falls.	◆◆Improve passage and habitat conditions in Bear Creek by acquiring water rights from willing sellers, evaluating the removal of diversion structures, or providing alternative sources of water during important periods for chinook salmon and steelhead passage and rearing.	◆◆ Work with landowners, diverters, and other State or federal agencies managing Battle Creek to improve fish passage.	◆◆ Increase the success of spawning chinook salmon and steelhead in Cottonwood Creek by managing or reconstructing facilities and structures that impair fish passage.

Notes: Target classification:

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Table 4. Continued.

Ecosystem Element	North Sacramento Valley Ecological Zone				Cottonwood Creek Ecological Zone Targets
	Clear Creek Targets	Cow Creek Targets	Bear Creek Targets	Battle Creek Targets	
Implementation Objective: Reduce entrainment of juvenile fish into water diversions by screening or consolidating diversions or by altering diversion timing in order to increase survival and cohort replacement levels.					
Water Diversions	◆◆ Reduce or eliminate the adverse effects of water diversion on chinook salmon and steelhead populations at all diversion sites on Clear Creek.	◆◆ Reduce loss of juvenile fish at diversions.	◆◆ Reduce loss of juvenile fish at diversions.	◆◆ Reduce or eliminate the adverse effects of water diversion on chinook salmon and steelhead populations at all diversion sites on Battle Creek.	None developed.

Notes: Target classification:

◆ = Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ = Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ = Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 4. Continued.

Ecosystem Element	North Sacramento Valley Ecological Zone				Cottonwood Creek Ecological Zone Targets
	Clear Creek Targets	Cow Creek Targets	Bear Creek Targets	Battle Creek Targets	
Implementation Objective: Reduce the level or incidence of harvest of wild, naturally produced Bay-Delta fish populations and focus harvest on hatchery produced fish in order to protect and increase the productive potential of wild fish populations. .					
Harvest of Fish and Wildlife	◆◆ Develop harvest management strategies that provide spawning adult abundance at levels to fully utilize existing and restored habitat, and focus harvest on hatchery-produced fish.	◆◆ Develop harvest management strategies that provide spawning adult abundance at levels to fully utilize existing and restored habitat, and focus harvest on hatchery-produced fish.	◆◆ Develop harvest management strategies that provide spawning adult abundance at levels to fully utilize existing and restored habitat, and focus harvest on hatchery-produced fish.	◆◆ Develop harvest management strategies that provide spawning adult abundance at levels to fully utilize existing and restored habitat, and focus harvest on hatchery-produced fish.	◆◆ Develop harvest management strategies that provide spawning adult abundance at levels to fully utilize existing and restored habitat, and focus harvest on hatchery-produced fish.

Notes: Target classification:

◆ =Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 4. Continued.

Ecosystem Element	North Sacramento Valley Ecological Zone				Cottonwood Creek Ecological Zone Targets
	Clear Creek Targets	Cow Creek Targets	Bear Creek Targets	Battle Creek Targets	
Implementation Objective: Protect and restore the genetic diversity of naturally producing populations of salmon and steelhead to sustain the long-term viability of the populations.					
Artificial Propagation of Fish	None developed.	None developed.	None developed.	<p>◆◆ Minimize the likelihood that hatchery-reared salmon and steelhead produced in the Coleman National Fish Hatchery will stray into non-natal stream to protect naturally produced chinook salmon and steelhead.</p> <p>◆◆ Limit hatchery stocking if populations of chinook salmon or steelhead can be sustained by natural production.</p>	

Notes: Target classification:

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Table 5. Summary of Butte Basin Ecological Zone Targets.

Ecosystem Element	Butte Basin Ecological Zone Targets						
	Paynes Creek Targets	Antelope Creek Targets	Mill Creek Targets	Deer Creek Targets	Big Chico Creek Targets	Butte Creek Targets	Butte Sink Targets
<i>Implementation Objective: Restore basic features of the hydrograph in order to reactivate and maintain ecological processes and functions that create and maintain habitat required to sustain healthy fish, wildlife, and plant populations.</i>							
Central Valley Streamflows	◆◆ Increase flow in spring and fall by 15-25 cfs.	◆◆ Increase flow by 15-30 cfs during October 1 through June 30.	◆◆ Increase flow by 25-50 cfs.	◆◆ Increase flow in lower 10 miles by 25-50 cfs.	◆◆ Increase flow by 50-75 cfs.	◆◆ Increase flow by 25-50 cfs. ◆◆ Provide 40 cfs below Centerville Diversion Dam.	Not applicable.

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Table 5. Continued.

Ecosystem Element	Butte Basin Ecological Zone Targets						
	Paynes Creek Targets	Antelope Creek Targets	Mill Creek Targets	Deer Creek Targets	Big Chico Creek Targets	Butte Creek Targets	Butte Sink Targets
<i>Implementation Objective: Establish an adequate sediment supply to riverine and estuarine systems in order to restore or reactivate stream channel meander, point bar formation, provide sediments to rebuild wetlands and shallow water habitats, and provide for nutrient transport.</i>							
Natural Sediment Supply	None developed.	None developed.	◆◆◆ Develop a cooperative program to improve the quality of chinook salmon spawning habitat in the lower 8 miles of Mill Creek for fall- and late-fall-run chinook salmon.	◆◆◆ Maintain gravel recruitment and transport at about 3,600 tons per year.	◆◆◆ Develop a cooperative program to replenish spawning gravel especially in stream reaches that have been modified for flood control so that there is no net loss of sediments transported through the system.	◆◆◆ Improve spawning gravel and gravel availability in Butte Creek.	Not applicable.

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Table 5. Continued.

Ecosystem Element	Butte Basin Ecological Zone Targets						
	Paynes Creek Targets	Antelope Creek Targets	Mill Creek Targets	Deer Creek Targets	Big Chico Creek Targets	Butte Creek Targets	Butte Sink Targets
<i>Implementation Objective: Maintain, improve, or restore natural stream meander processes in order to allow the natural recruitment of sediments, create habitats, and promote natural riparian succession processes.</i>							
Stream Meander Corridors	◆ Preserve or restore 50- to 100-year flood-plains along lower stream reach.	◆ Preserve or restore 50- to 100-year flood-plains along lower stream reach.	◆ Preserve or restore 50- to 100-year flood-plains along lower stream reach.	◆ Preserve or restore 50- to 100-year flood-plains along lower stream reach.	◆ Preserve or restore 50- to 100-year flood-plains along lower stream reach.	◆ Preserve or restore 50- to 100-year flood-plains along lower stream reach.	None developed.

Notes: Target classification: ◆ =Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 5. Continued.

Ecosystem Element	Butte Basin Ecological Zone Targets						
	Paynes Creek Targets	Antelope Creek Targets	Mill Creek Targets	Deer Creek Targets	Big Chico Creek Targets	Butte Creek Targets	Butte Sink Targets
Implementation Objective: <i>Restore ecological processes in the upper watershed that affect the quantity and quality of water in the Bay-Delta, rivers, and tributaries.</i>							
Upper Watershed Health and Function	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.

Notes: Target classification:

◆ =Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 5. Continued.

Ecosystem Element	Butte Basin Ecological Zone Targets						
	Paynes Creek Targets	Antelope Creek Targets	Mill Creek Targets	Deer Creek Targets	Big Chico Creek Targets	Butte Creek Targets	Butte Sink Targets
<i>Implementation Objective: Restore riparian scrub, woodland, and forest habitat along largely unvegetated riprapped banks of Delta island levees, along the Sacramento and San Joaquin Rivers, and along major tributaries of the Sacramento and San Joaquin Rivers in order to create corridors of riparian vegetation that provide shaded riverine aquatic cover for anadromous and other fish species; and to create high-quality habitat for associated special-status plant and animal species, and other associated wildlife.</i>							
Riparian and Riverine Aquatic Habitats	None developed.	None developed.	◆◆ Develop a cooperative program to restore and maintain riparian habitat along the lower 10 miles.	◆◆ Develop a cooperative program to restore and maintain riparian habitat along the lower 10 miles.	◆◆ Develop a cooperative program to restore and maintain riparian habitat along the lower 15 miles.	None developed.	None developed.

Notes: Target classification:

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Table 5. Continued.

Ecosystem Element	Butte Basin Ecological Zone Targets						
	Paynes Creek Targets	Antelope Creek Targets	Mill Creek Targets	Deer Creek Targets	Big Chico Creek Targets	Butte Creek Targets	Butte Sink Targets
<i>Implementation Objective: Reduce entrainment of juvenile fish into water diversions by screening or consolidating diversions or by altering diversion timing in order to increase survival and cohort replacement levels.</i>							
Water Diversions	◆◆ Install positive barrier fish screens on 15 diversions.	◆◆ Install positive barrier fish screens on diversions.	◆◆ Install positive barrier fish screens on diversions.	Not applicable.	◆◆ Improve the survival of chinook salmon and steelhead by cooperatively developing a program to provide unimpaired access to the creek 100 percent of the time.	◆◆ Improve the survival of juvenile chinook salmon and steelhead by installing positive barrier fish screens on 8 diversions.	None developed.

Notes: Target classification:

◆ =Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 5. Continued.

Ecosystem Element	Butte Basin Ecological Zone Targets						
	Paynes Creek Targets	Antelope Creek Targets	Mill Creek Targets	Deer Creek Targets	Big Chico Creek Targets	Butte Creek Targets	Butte Sink Targets
<i>Implementation Objective: Increase the connection of upstream spawning and rearing habitats with the mainstem rivers in the Sacramento-San Joaquin basin in order to increase success of adult spawners and survival of juvenile downstream migrants.</i>							
Dams, Reservoirs, Weirs, and Other Human-Made Structures	None developed.	◆◆ Reduce use of seasonal barrier/ diversion dams by 50 percent during late spring and early fall and winter.	◆◆ Develop a cooperative approach to provide salmon and steelhead access to 100 percent of available habitat.	Not applicable.	◆◆ Develop a cooperative approach to provide access to 100 percent of habitat located below natural barriers.	◆◆ Develop a cooperative approach to provide salmon and steelhead access to 100 percent of habitat below Centerville Diversion Dam.	◆◆ Improve fish passage at diversion dams.

Notes: Target classification: ◆ = Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ = Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ = Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 5. Continued.

Ecosystem Element	Butte Basin Ecological Zone Targets						
	Paynes Creek Targets	Antelope Creek Targets	Mill Creek Targets	Deer Creek Targets	Big Chico Creek Targets	Butte Creek Targets	Butte Sink Targets
<i>Implementation Objective: Reduce the level or incidence of harvest of wild, naturally produced Bay-Delta fish populations and focus harvest on hatchery produced fish in order to protect and increase the productive potential of wild fish populations.</i>							
Harvest of Fish and Wildlife	◆ Develop harvest management strategies that provide spawning adult chinook salmon and steelhead at levels to fully utilize existing and restored habitat and focus harvest on hatchery-produced fish.	◆ Develop harvest management strategies that provide spawning adult chinook salmon and steelhead at levels to fully utilize existing and restored habitat and focus harvest on hatchery-produced fish.	◆ Develop harvest management strategies that provide spawning adult chinook salmon and steelhead at levels to fully utilize existing and restored habitat and focus harvest on hatchery-produced fish.	◆ Develop harvest management strategies that provide spawning adult chinook salmon and steelhead at levels to fully utilize existing and restored habitat and focus harvest on hatchery-produced fish.	◆ Develop harvest management strategies that provide spawning adult chinook salmon and steelhead at levels to fully utilize existing and restored habitat and focus harvest on hatchery-produced fish.	◆ Develop harvest management strategies that provide spawning adult chinook salmon and steelhead at levels to fully utilize existing and restored habitat and focus harvest on hatchery-produced fish.	Not applicable.

Notes: Target classification:

◆ =Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 6. Summary of Colusa Basin Ecological Zone Targets.

Ecosystem Element	Colusa Basin Ecological Zone			
	Stony Creek Targets	Elder Creek Targets	Thomes Creek Targets	Colusa Basin Targets
<i>Implementation Objective: Restore basic features of the hydrograph in order to reactivate and maintain ecological processes and functions that create and maintain habitat required to sustain healthy fish, wildlife, and plant populations.</i>				
Central Valley Streamflows	◆◆ More closely emulate natural seasonal hydrologic patterns in most water-year types by providing flows that mobilize and transport sediments, allow upstream and downstream fish passage, create point bars, and contribute to stream channel meander and riparian vegetation succession. Allow or maintain flows in Stony Creek of 100-150 cfs from October 1 to May 31 to attract fall-run chinook salmon and encourage migration, spawning, and emigration.	◆◆ Provide flows in Elder Creek that correspond to the seasonal runoff pattern.	None developed.	Not applicable.

Notes: Target classification: ◆ = Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ = Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ = Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 6. Continued.

Ecosystem Element	Colusa Basin Ecological Zone			
	Stony Creek Targets	Elder Creek Targets	Thomes Creek Targets	Colusa Basin Targets
<i>Implementation Objective: Establish an adequate sediment supply to riverine and estuarine systems in order to restore or reactivate stream channel meander, point bar formation, provide sediments to rebuild wetlands and shallow water habitats, and provide for nutrient transport.</i>				
Natural Sediment Supply	◆◆ Develop a cooperative program to improve the quantity of sediment transported in Stony Creek to improve salmon spawning habitat.	◆◆ Improve the quantity of sediment transported and maintain an average bedload of 34,000 tons per year.	◆◆ Increase the quantity of sediment available for transport during storms and seasonal flow events. Improve the quantity of sediments transported and maintain an average annual bedload of 32,000-62,500 tons per year to improve salmon spawning habitat.	Not applicable.

Notes: Target classification: ◆ = Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ = Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ = Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 6. Continued.

Ecosystem Element	Colusa Basin Ecological Zone			
	Stony Creek Targets	Elder Creek Targets	Thomes Creek Targets	Colusa Basin Targets
<i>Implementation Objective: Maintain, improve, or restore natural stream meander processes in order to allow the natural recruitment of sediments, create habitats, and promote natural riparian succession processes.</i>				
Stream Meander Corridors	◆◆ Preserve channel meander characteristics of streams in the Colusa Basin Ecological Zone, particularly in low-gradient areas where most deposition takes place and stream channel meander is most pronounced. Improve channel meander in Stony Creek and create a distinct stream channel in the 18-mile stream reach below North Diversion Dam.	◆◆ Preserve channel meander characteristics of streams in the Colusa Basin Ecological Zone, particularly in low-gradient areas where most deposition takes place and stream channel meander is most pronounced. Improve channel meander in lower 10 miles of Elder Creek.	◆◆ Preserve channel meander characteristics of streams in the Colusa Basin Ecological Zone, particularly in low-gradient areas where most deposition takes place and stream channel meander is most pronounced. Improve channel meander in Thomes Creek.	Not applicable.

Notes: Target classification: ◆ = Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ = Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ = Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 6. Continued.

Ecosystem Element	Colusa Basin Ecological Zone			
	Stony Creek Targets	Elder Creek Targets	Thomes Creek Targets	Colusa Basin Targets
<i>Implementation Objective: Modify channel and basin configurations in order to improve floodplain function along rivers and stream in the Sacramento-San Joaquin basin.</i>				
Natural Floodplain and Flood Processes	None developed.	None developed.	None developed.	◆ Reestablish sediment deposition in the floodplain.
<i>Implementation Objective: Modify channel and basin configurations in order to improve floodplain function along rivers and streams in the Sacramento-San Joaquin basin.</i>				
Natural Fluvial Geomorphology	◆◆ Improve stream channel of Stony Creek in 18-mile reach below North Diversion Dam.	None developed.	None developed.	Not applicable.

Notes: Target classification: ◆ = Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ = Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ = Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 6. Continued.

Ecosystem Element	Colusa Basin Ecological Zone			
	Stony Creek Targets	Elder Creek Targets	Thomes Creek Targets	Colusa Basin Targets
<i>Implementation Objective: Maintain, improve, and restore water temperature regimes in order to meet life history needs of aquatic organisms.</i>				
Central Valley Stream Temperatures	None developed.	None developed.	None developed.	◆ Establish and maintain suitable water temperatures in the outflow of the Colusa Basin Drain during summer and fall base-flow periods and in low-flow springs of drier years to minimize adverse effects on fish populations and other aquatic organisms in the Sacramento River.
<i>Implementation Objective: Restore the ecological processes in upper watersheds that affect the quantity and quality of water in Bay-Delta, rivers, and tributaries.</i>				
Upper Watershed Health and Functions	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.	Not applicable.

Notes: Target classification: ◆ =Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 6. Continued.

Ecosystem Element	Colusa Basin Ecological Zone			
	Stony Creek Targets	Elder Creek Targets	Thomes Creek Targets	Colusa Basin Targets
<i>Implementation Objective: Increase the connection of upstream spawning and rearing habitats with the mainstem rivers in the Sacramento-San Joaquin Basin to increase the success of spawning adults and the survival of juvenile downstream migrants.</i>				
Water Diversions	◆◆ Reduce stranding or straying of fish migration in streams in the Colusa Basin Ecological Zone.	◆◆ Reduce stranding or straying of fish migration in streams in the Colusa Basin Ecological Zone.	◆◆ Reduce stranding or straying of fish migration in streams in the Colusa Basin Ecological Zone.	◆◆ Reduce stranding or straying of fish migration in streams in the Colusa Basin Ecological Zone.

Notes: Target classification: ◆ =Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 6. Continued.

Ecosystem Element	Colusa Basin Ecological Zone			
	Stony Creek Targets	Elder Creek Targets	Thomes Creek Targets	Colusa Basin Targets
<i>Implementation Objective: Increase the connection of upstream spawning and rearing habitats with the mainstem rivers in the Sacramento-San Joaquin basin in order to increase success of adult spawners and survival of juvenile downstream migrants</i>				
Dams, Reservoirs, Weirs, and Other Human-Made Structures	◆◆ Develop a cooperative program to improve fish passage at water diversion structures to increase the success of spawning adult salmon in Stony Creek to allow access to 18-24 miles of habitat.	None developed.	◆◆ Reduce use of seasonal diversion dams that are barriers to migrating chinook salmon and steelhead.	◆◆ Develop a cooperative approach for the diversion of water in the fall for agricultural use while providing sufficient flows to permit the upstream passage of adult chinook salmon and steelhead and the downstream migration of juvenile fish.
<i>Implementation Objective: Reduce concentrations and loadings of contaminants in the aquatic environment and the subsequent bioaccumulation by aquatic species in order to increase survival and eliminate public health concerns.</i>				
Contaminants	Not applicable.	Not applicable.	Not applicable.	◆ Reduce the adverse effects of herbicides, pesticides, fumigants, and other agents toxic to fish and wildlife.

Notes: Target classification:

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Table 7. Summary of Feather River/Sutter Basin Ecological Zone Targets.

Ecosystem Element	Ecological Zone			
	Sutter Bypass Targets	Feather River Targets	Yuba River Targets	Bear River Targets
<i>Implementation Objective: Restore basic features of the hydrograph in order to reactivate and maintain ecological processes and functions that create and maintain habitat required to sustain healthy fish, wildlife, and plant populations.</i>				
Central Valley Streamflows	Not applicable.	◆◆ More closely emulate the seasonal streamflow pattern in the Feather river by providing a 10-day flow event in March as follow: 4,000-6,000 cfs (dry years), 6,000-8,000 cfs (below-normal years), 8,000-10,000 cfs (above- normal years), and by providing or maintaining flows that mobilize and transport sediment, allow upstream and downstream fish passage, create point bars, and contribute to stream channel meander and riparian vegetation processes.	◆◆ Supplement flows in the Yuba River by providing a 10-day flow event in March with flows of 2,000-3,000 cfs in dry years and 3,000-4,000 in below normal and above normal years to improve conditions for all life stages of chinook salmon, steelhead, and American shad.	◆◆ Supplement flows in the Bear River to improve conditions for all life stages of chinook salmon and steelhead by providing a 10-day flow event in March of 300-500 cfs of dry years.

Notes: Target classification:

- ◆ =Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 7. Continued.

Ecosystem Element	Ecological Zone			
	Sutter Bypass Targets	Feather River Targets	Yuba River Targets	Bear River Targets
<i>Implementation Objective: Establish an adequate sediment supply to riverine and estuarine systems in order to restore or reactivate stream channel meander, point bar formation, provide sediments to rebuild wetlands and shallow water habitats, and provide for nutrient transport.</i>				
Natural Sediment Supply	Not applicable.	◆ Maintain existing levels of erosion and gravel recruitment in tributaries that sustain an adequate level of gravel recruitment, or restore desirable levels by directly manipulating and augmenting gravel supplies where the natural fluvial process has been interrupted by dams or other features that retain or remove the gravel supply.	◆ Maintain existing levels of erosion and gravel recruitment in tributaries that sustain an adequate level of gravel recruitment, or restore desirable levels by directly manipulating and augmenting gravel supplies where the natural fluvial process has been interrupted by dams or other features that retain or remove the gravel supply.	◆ Maintain existing levels of erosion and gravel recruitment in tributaries that sustain an adequate level of gravel recruitment, or restore desirable levels by directly manipulating and augmenting gravel supplies where the natural fluvial process has been interrupted by dams or other features that retain or remove the gravel supply.

Notes: Target classification:

◆ =Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.



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Table 7. Continued.

Ecosystem Element	Ecological Zone			
	Sutter Bypass Targets	Feather River Targets	Yuba River Targets	Bear River Targets
<i>Implementation Objective: Maintain, improve, or restore natural stream meander processes in order to allow the natural recruitment of sediments, create habitats, and promote natural riparian succession processes.</i>				
Stream Meander Corridors	Not applicable.	◆◆◆ Preserve and expand the stream meander belts in the Feather, Yuba, and Bear rivers by adding a cumulative total of 1,000 acres of riparian lands in meander zones.	◆◆◆ Preserve and expand the stream meander belts in the Feather, Yuba, and Bear rivers by adding a cumulative total of 1,000 acres of riparian lands in meander zones.	◆◆◆ Preserve and expand the stream meander belts in the Feather, Yuba, and Bear rivers by adding a cumulative total of 1,000 acres of riparian lands in meander zones.

Notes: Target classification:

◆ = Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ = Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ = Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 7. Continued.

Ecosystem Element	Ecological Zone			
	Sutter Bypass Targets	Feather River Targets	Yuba River Targets	Bear River Targets
<i>Implementation Objective: Modify channel and basin configurations in order to improve floodplain function along rivers and streams in the Sacramento-San Joaquin Basin.</i>				
Natural Floodplains and Flood Processes	◆◆ Maintain existing levels of floodwater retention in the Sutter Basin, decrease adverse effects on migratory pathways used by chinook salmon and steelhead to reach Butte Creek, and decrease adverse effects on chinook salmon and steelhead by diverting water for seasonally flooded wetland areas.	None developed.	None developed.	None developed.

Notes: Target classification:

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Table 7. Continued.

Ecosystem Element	Ecological Zone			
	Sutter Bypass Targets	Feather River Targets	Yuba River Targets	Bear River Targets
<i>Implementation Objective: Maintain, improve, and restore water temperature regimes in order to meet life history needs of aquatic organisms.</i>				
Central Valley Stream Temperatures	None developed.	◆ Identify and implement actions that maintain mean daily water temperatures between 61°F and 65°F for at least 1 month from April 1 to June 30 for American shad spawning in the Feather River, consistent with actions to protect chinook salmon and steelhead and when hydrologic conditions are adequate to minimize adverse effects on water supply operations.	◆ Identify and implement actions that maintain mean daily water temperatures between 61°F and 65°F for at least 1 month from April 1 to June 30 for American shad spawning in the Yuba River, consistent with actions to protect chinook salmon and steelhead and when hydrologic conditions are adequate to minimize adverse effects on water supply operations.	◆ Provide the following daily mean water temperatures in the Bear River: October 1-14: 60°F; October 15-December 15: 58°F; January-March: 56°F; April-June: 60°F; and July-September: 65°F.

Notes: Target classification:

- ◆ =Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 7. Continued.

Ecosystem Element	Ecological Zone			
	Sutter Bypass Targets	Feather River Targets	Yuba River Targets	Bear River Targets
<i>Implementation Objective: Restore ecological processes in upper watersheds that affect the quantity and quality of water in the Bay-Delta, rivers, and tributaries.</i>				
Upper Watershed Health and Function	Not applicable.	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.
<i>Implementation Objective: Restore riparian scrub, woodland, and forest habitat along largely unvegetated riprapped banks of Delta island levees, along the Sacramento and San Joaquin Rivers, and along major tributaries of the Sacramento and San Joaquin Rivers in order to create corridors of riparian vegetation to provide shaded riverine aquatic cover for anadromous and other fish species, and to create high-quality habitat for associated special-status plant and animal species, and other associated wildlife.</i>				
Riparian and Shaded Riverine Aquatic Habitat	◆◆◆ Provide conditions for growth of riparian vegetation along sections of the Feather River/Sutter Basin Ecological Zone.	◆◆◆ Provide conditions for growth of riparian vegetation along sections of rivers in the Feather River/Sutter Basin Ecological Zone.	◆◆◆ Provide conditions for growth of riparian vegetation along sections of rivers in the Feather River/Sutter Basin Ecological Zone.	◆◆◆ Provide conditions for growth of riparian vegetation along sections of rivers in the Feather River/Sutter Basin Ecological Zone.

Notes: Target classification: ◆ = Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ = Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ = Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 7. Continued.

Ecosystem Element	Ecological Zone			
	Sutter Bypass Targets	Feather River Targets	Yuba River Targets	Bear River Targets
<i>Implementation Objective: Reduce entrainment of juvenile fish into water diversions by screening or consolidating diversions or by altering diversion timing in order to increase survival and cohort replacement levels.</i>				
Water Diversions	◆◆ Develop a cooperative program to reduce entrainment of juvenile fish into water diversions.	◆◆ Develop a cooperative program to reduce entrainment of juvenile fish into water diversions.	◆◆ Develop a cooperative program to reduce entrainment of juvenile fish into water diversions.	◆◆ Develop a cooperative program to reduce entrainment of juvenile fish into water diversions.
<i>Implementation Objective: Increase the connection of upstream spawning and rearing habitats with the mainstem rivers in the Sacramento-San Joaquin basin in order to increase success of adult spawners and survival of juvenile downstream migrants.</i>				
Dams, Reservoirs, Weirs, and Other Human-Made Structures	None developed.	None developed.	◆◆◆ Increase survival of adult and juvenile anadromous fish in the Yuba River by providing access to 100 percent of available habitat below Englebright Dam.	◆◆◆ Improve survival and passage of chinook salmon and steelhead in the Bear River by access to 100 percent of available habitat below the South Sutter Water District diversion dam.

Notes: Target classification:

◆ = Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ = Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ = Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 7. Continued.

Ecosystem Element	Ecological Zone			
	Sutter Bypass Targets	Feather River Targets	Yuba River Targets	Bear River Targets
<i>Implementation Objective: Reduce the level or incidence of harvest of wild, naturally produced Bay-Delta fish populations and focus harvest on hatchery-produced fish to protect and increase the productive potential of wild fish populations.</i>				
Harvest of Fish and Wildlife	Not applicable.	◆ Develop harvest management strategies that allow spawning populations of wild, naturally produced fish to attain levels that make full use of existing and restored habitat, and focus harvest on hatchery-produced fish.	◆ Develop harvest management strategies that allow spawning populations of wild, naturally produced fish to attain levels that make full use of existing and restored habitat, and focus harvest on hatchery-produced fish.	◆ Develop harvest management strategies that allow spawning populations of wild, naturally produced fish to attain levels that make full use of existing and restored habitat, and focus harvest on hatchery-produced fish.

Notes: Target classification:

◆ =Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 7. Continued.

Ecosystem Element	Ecological Zone			
	Sutter Bypass Targets	Feather River Targets	Yuba River Targets	Bear River Targets
<i>Implementation Objective: Reduce the potentially adverse effects of stocking artificially produced fish throughout Central Valley rivers and streams in order to increase the survival of naturally produced fish and contribute to long-term restoration goals.</i>				
Artificial Propagation of Fish	Not applicable.	<p>◆ Minimize the likelihood that hatchery-reared salmon and steelhead produced in Feather River Hatchery will stray into non-natal streams to protect naturally produced salmon and steelhead.</p> <p>◆ Limit hatchery stocking if populations of salmon and steelhead can be sustained by natural production.</p>	Not applicable.	Not applicable.

Notes: Target classification:

◆ =Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 8. Summary of Yolo Basin Ecological Zone Targets.

Ecosystem Element	Yolo Basin Ecological Zone		
	Cache Creek Targets	Putah Creek Targets	Solano Targets
<i>Implementation Objective: Restore basic features of the hydrograph in order to reactivate and maintain ecological processes and functions that create and maintain habitat required to sustain healthy fish, wildlife, and plant populations.</i>			
Central Valley Streamflows	<p>◆◆ More closely emulate the pattern of the seasonal hydrograph in Cache and Putah creeks by providing and allowing approximately 50-100 cfs in all but critical years to reach the Yolo Bypass, and providing winter base flows sufficient to sustain salmon spawning and rearing.</p> <p>◆◆ Provide a portion of the natural late-winter/early spring (March) flow in Cache and Putah creeks of 100-200 cfs in dry years and 300-400 cfs in below normal and above normal years.</p>	<p>◆◆ More closely emulate the pattern of the seasonal hydrograph in Cache and Putah creeks by providing and allowing approximately 50-100 cfs in all but critical years to reach the Yolo Bypass, and providing winter base flows sufficient to sustain salmon spawning and rearing.</p> <p>◆◆ Provide a portion of the natural late-winter/early spring (March) flow in Cache and Putah creeks of 100-200 cfs in dry years and 300-400 cfs in below normal and above normal years.</p>	None developed.

Notes: Target classification: ◆ = Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ = Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ = Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 8. Continued.

Ecosystem Element	Yolo Basin Ecological Zone		
	Cache Creek Targets	Putah Creek Targets	Solano Targets
<i>Implementation Objective: Establish an adequate sediment supply to riverine and estuarine systems in order to restore or reactivate stream channel meander, point bar formation, provide sediments to rebuild wetlands and shallow water habitats, and provide for nutrient transport.</i>			
Natural Sediment Supply	◆◆ Restore a desirable level of gravel recruitment in spawning and rearing areas of salmon and steelhead in Cache and Putah creeks to meet the needs of spawning fish, maintain natural stream channel meanders and bar formation, and match existing rates of downstream displacement.	◆◆ Restore a desirable level of gravel recruitment in spawning and rearing areas of salmon and steelhead in Cache and Putah creeks to meet the needs of spawning fish, maintain natural stream channel meanders and bar formation, and match existing rates of downstream displacement.	None developed.

Notes: Target classification:

◆ = Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ = Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ = Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 8. Continued.

Ecosystem Element	Yolo Basin Ecological Zone		
	Cache Creek Targets	Putah Creek Targets	Solano Targets
<i>Implementation Objective: Modify channel and basin configurations in order to improve floodplain function along rivers and streams in the Sacramento-San Joaquin basin.</i>			
Natural Fluvial Geomorphology	◆ More closely emulate natural slough and stream channel configurations in Cache Creek and Putah Creek and in channels and sloughs of the upper Yolo Bypass to provide connections with the Delta in a manner consistent with flood control requirements.	◆ More closely emulate natural slough and stream channel configurations in Cache Creek and Putah Creek and in channels and sloughs of the upper Yolo Bypass to provide connections with the Delta in a manner consistent with flood control requirements.	None developed.
<i>Implementation Objective: Maintain, improve, or restore natural stream meander processes in order to allow the natural recruitment of sediments, create habitats, and promote natural riparian succession processes.</i>			
Stream Meander Corridors	None developed.	None developed.	None developed.

Notes: Target classification:

◆ =Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 8. Continued.

Ecosystem Element	Yolo Basin Ecological Zone		
	Cache Creek Targets	Putah Creek Targets	Solano Targets
<i>Implementation Objective: Modify channel and basin configurations in order to improve floodplain function along rivers and streams in the Sacramento-San Joaquin basin.</i>			
Natural Flood and Floodplain Processes	<p>◆◆ Increase the area, frequency, and duration of flooding to the existing Cache and Putah creek floodplains during the wet season, where feasible and consistent with flood control requirements.</p> <p>◆ Increase overbank flooding potential to floodplains, there feasible and consistent with flood protection, to support a desirable vegetation succession process.</p>	<p>◆◆ Increase the area, frequency, and duration of flooding to the existing Cache and Putah creek floodplains during the wet season, where feasible and consistent with flood control requirements.</p> <p>◆ Increase overbank flooding potential to floodplains, there feasible and consistent with flood protection, to support a desirable vegetation succession process.</p>	None developed.

Notes: Target classification:

- ◆ =Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 8. Continued.

Ecosystem Element	Yolo Basin Ecological Zone		
	Cache Creek Targets	Putah Creek Targets	Solano Targets
<i>Implementation Objective: Restore ecological processes in upper watersheds that affect the quantity and quality of water in the Bay-Delta, rivers, and tributaries.</i>			
Upper Watershed Health and Function	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.	None developed.
<i>Implementation Objective: Restore riparian scrub, woodland, and forest habitat along largely unvegetated riprapped banks of Delta island levees, along the Sacramento and San Joaquin Rivers, and along major tributaries of the Sacramento and San Joaquin Rivers in order to create corridors of riparian vegetation to provide shaded riverine aquatic cover for anadromous and other fish species, and to create high-quality habitat for associated special-status plant and animal species, and other associated wildlife.</i>			
Riparian and Riverine Aquatic Habitats	◆◆ Restore riparian vegetation along Cache Creek, Putah Creek, and Yolo Bypass and Solano Ecological Unit channels and sloughs where possible to provide cover and other habitats required by chinook salmon, steelhead, native resident species, and wildlife.	◆◆ Restore riparian vegetation along Cache Creek, Putah Creek, and Yolo Bypass and Solano Ecological Unit channels and sloughs where possible to provide cover and other habitats required by chinook salmon, steelhead, native resident species, and wildlife.	◆◆ Restore riparian vegetation along Cache Creek, Putah Creek, and Yolo Bypass and Solano Ecological Unit channels and sloughs where possible to provide cover and other habitats required by chinook salmon, steelhead, native resident species, and wildlife.

Notes: Target classification:

- ◆ = Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ = Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ = Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 8. Continued.

Ecosystem Element	Yolo Basin Ecological Zone		
	Cache Creek Targets	Putah Creek Targets	Solano Targets
<i>Implementation Objective: Reduce entrainment of juvenile fish into water diversions by screening or consolidating diversions or by altering diversion timing in order to increase survival and cohort replacement levels.</i>			
Water Diversions	<p>◆◆◆ Eliminate, relocate, or screen diversions in the lower reaches of Cache and Putah creeks and channels and sloughs of the Yolo Bypass.</p> <p>◆◆ Ensure adult chinook salmon and steelhead do not become stranded during their upstream migrations.</p>	<p>◆◆◆ Eliminate, relocate, or screen diversions in the lower reaches of Cache and Putah creeks and channels and sloughs of the Yolo Bypass.</p> <p>◆◆ Ensure adult chinook salmon and steelhead do not become stranded during their upstream migrations.</p>	None developed.
<i>Implementation Objective: Increase the connection of upstream spawning and rearing habitats with the mainstem rivers in the Sacramento-San Joaquin basin in order to increase success of adult spawners and survival of juvenile downstream migrants.</i>			
Dams, Reservoirs, Weirs, and Other Human-Made Structures	◆◆ Improve fish passage between the Delta and spawning grounds in Putah and Cache creeks and the upper Sacramento River watersheds.	◆◆ Improve fish passage between the Delta and spawning grounds in Putah and Cache creeks and the upper Sacramento River watersheds.	None developed.

Notes: Target classification:

- ◆ = Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ = Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ = Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 8. Continued.

Ecosystem Element	Yolo Basin Ecological Zone		
	Cache Creek Targets	Putah Creek Targets	Solano Targets
<i>Implementation Objective: Maintain, improve, restore, or supplement gravel recruitment processes in riverine systems of the Sacramento-San Joaquin basin in order to provide spawning substrate for anadromous fish, promote riparian succession, maintain stream channel gradient, and dissipate stream energy to prevent deep scour.</i>			
Gravel Mining and Recruitment	◆◆ Protect, enhance, and restore natural gravel recruitment in areas of active and inactive gravel mining.	◆◆ Protect, enhance, and restore natural gravel recruitment in areas of active and inactive gravel mining.	None developed.
<i>Implementation Objective: Reduce extent of harmful invasive exotic plants in order to reduce competition with native riparian, native saline, and fresh emergent marsh vegetation; and keep Delta waterways open.</i>			
Invasive Riparian and Salt Marsh Plants	◆◆◆ Reduce populations of invasive non-native plant species that compete with the establishment and succession of native riparian vegetation along Cache Creek and Putah Creek to assist in the natural reestablishment of native riparian vegetation in floodplains, increase shaded riverine aquatic habitat for fish, and increase habitat values for riparian-associated wildlife.	◆◆◆ Reduce populations of invasive non-native plant species that compete with the establishment and succession of native riparian vegetation along Cache Creek and Putah Creek to assist in the natural reestablishment of native riparian vegetation in floodplains, increase shaded riverine aquatic habitat for fish, and increase habitat values for riparian-associated wildlife.	None developed.

Notes: Target classification:

- ◆ = Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ = Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ = Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 8. Continued.

Ecosystem Element	Yolo Basin Ecological Zone		
	Cache Creek Targets	Putah Creek Targets	Solano Targets
<i>Implementation Objective: Reduce the level or incidence of harvest of wild, naturally produced Bay-Delta fish populations and focus harvest on hatchery produced fish in order to protect and increase the productive potential of wild fish populations.</i>			
Harvest of Fish and Wildlife	◆ Develop harvest management strategies that allow spawning populations of wild, naturally produced fish to attain levels that make full use of existing and restored habitat, and focus harvest on hatchery-produced fish.	◆ Develop harvest management strategies that allow spawning populations of wild, naturally produced fish to attain levels that make full use of existing and restored habitat, and focus harvest on hatchery-produced fish.	None developed.

Notes: Target classification:

◆ =Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 9. Summary of Eastside Delta Tributaries Ecological Zone Targets.

Ecosystem Element	Eastside Delta Tributaries Ecological Zone		
	Cosumnes River Targets	Mokelumne River Targets	Calaveras River Targets
<i>Implementation Objective: Restore basic features of the hydrograph in order to reactivate and maintain ecological processes and functions that create and maintain habitat required to sustain healthy fish, wildlife, and plant populations.</i>			
Central Valley Streamflows	◆◆ For the Cosumnes River, where a natural stream flow pattern presently exists with natural winter and spring streamflows, the target is to restore summer and fall base flows to a natural level.	◆◆ For the Mokelumne River, with its greatly altered hydrologic regime, the target is to restore a natural streamflow pattern by implementing and evaluating the base flow regime in the Principles of Agreement for the lower Mokelumne River. In addition, streamflows should be enhanced below Camanche and Woodbridge dams by providing minimum flows in dry years of 200-300 cfs from November through September and 100 cfs in October. In normal years, minimum flows should be 250-450 cfs from October through November and 100-150 cfs from July through September. In wet years, minimum flows should be 300-450 cfs year round.	◆◆ A flow event should be allowed in late February or early March, with the flow averaging 100-200 cfs in dry years, 300-400 cfs in below normal and above normal years, and 600-800 cfs in wet years. Such flows would be provided only when inflows to New Hogan Reservoir are at these levels. ◆◆ Improve base flows.

Notes: Target classification:

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Table 9. Continued.

Ecosystem Element	Eastside Delta Tributaries Ecological Zone		
	Cosumnes River Targets	Mokelumne River Targets	Calaveras River Targets
<i>Implementation Objective: Establish an adequate sediment supply to riverine and estuarine systems in order to restore or reactivate stream channel meander, point bar formation, provide sediments to rebuild wetlands and shallow water habitats, and provide for nutrient transport.</i>			
Natural Sediment Supply	◆◆ Restore gravel transport and cleansing process to improve the quality of salmonid spawning gravel to the level necessary to support spawning needs of restored levels of fall-run chinook salmon.	◆◆ Restore gravel transport and cleansing process to improve the quality of salmonid spawning gravel to the level necessary to support spawning needs of restored levels of fall-run chinook salmon. ◆◆ Provide 5,000-10,000 cubic yards of gravel into the active stream channel.	◆◆ Restore gravel transport and cleansing process to improve the quality of salmonid spawning gravel to the level necessary to support spawning needs of restored levels of fall-run chinook salmon. . ◆◆ Provide 2,000-4,000 cubic yards of gravel into the active stream channel.
<i>Implementation Objective: Modify channel and basin configurations in order to improve floodplain function along rivers and streams in the Sacramento-San Joaquin basin.</i>			
Natural Floodplain and Flood Processes	◆ Restore floodplain processes of the rivers in the Eastside Delta Tributaries Ecological Unit.	◆ Restore floodplain processes of the rivers in the Eastside Delta Tributaries Ecological Unit.	◆ Restore floodplain processes of the rivers in the Eastside Delta Tributaries Ecological Unit.

Notes: Target classification:

◆ =Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 9. Continued.

Ecosystem Element	Eastside Delta Tributaries Ecological Zone		
	Cosumnes River Targets	Mokelumne River Targets	Calaveras River Targets
<i>Implementation Objective: Maintain, improve, and restore water temperature regimes in order to meet life history needs of aquatic organisms.</i>			
Central Valley Stream Temperatures	◆ Maintain mean daily water temperatures at or below levels suitable for maintenance of all life stages of chinook salmon and steelhead.	◆ Maintain mean daily water temperatures at or below levels suitable for maintenance of all life stages of chinook salmon and steelhead.	◆ Maintain mean daily water temperatures at or below levels suitable for maintenance of all life stages of chinook salmon and steelhead..
<i>Implementation Objective: Restore ecological processes in upper watersheds that affect the quantity and quality of water in the Bay-Delta, rivers, and tributaries.</i>			
Upper Watershed Health and Function	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.

Notes: Target classification:

- ◆ =Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 9 Continued.

Ecosystem Element	Eastside Delta Tributaries Ecological Zone		
	Cosumnes River Targets	Mokelumne River Targets	Calaveras River Targets
<i>Implementation Objective: Restore riparian scrub, woodland, and forest habitat along largely unvegetated riprapped banks of Delta island levees, along the Sacramento and San Joaquin Rivers, and along major tributaries of the Sacramento and San Joaquin Rivers in order to create corridors of riparian vegetation that provide shaded riverine aquatic cover for anadromous and other fish species; and to create high-quality habitat for associated special-status plant and animal species, and other associated wildlife.</i>			
Riparian and Riverine Aquatic Habitats	◆◆ Protect riparian habitat.	◆◆ Restore 15 miles of self-sustaining diverse riparian community.	◆◆ Protect riparian habitat.
<i>Implementation Objective: Reduce entrainment of juvenile fish into water diversions by screening or consolidating diversions or by altering diversion timing in order to increase survival and cohort replacement levels.</i>			
Water Diversions	◆◆ Reduce entrainment of fish and other aquatic organisms into diversions as much as possible.	◆◆ Reduce entrainment of fish and other aquatic organisms into diversions as much as possible.	◆◆ Reduce entrainment of fish and other aquatic organisms into diversions as much as possible.

Notes: Target classification:

◆ =Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 9. Continued.

Ecosystem Element	Eastside Delta Tributaries Ecological Zone		
	Cosumnes River Targets	Mokelumne River Targets	Calaveras River Targets
<i>Implementation Objective: Increase the connection of upstream spawning and rearing habitats with the mainstem rivers in the Sacramento-San Joaquin basin in order to increase success of adult spawners and survival of juvenile downstream migrants.</i>			
Dams, Reservoirs, Weirs, and Other Human-Made Structures	None developed.	◆◆◆ Improve fish passage at diversion dams.	◆◆◆ Improve fish passage at diversion dams.
<i>Implementation Objective: Reduce the loss of juvenile anadromous and resident fish and other aquatic organisms from unnatural levels of predation in order to increase survival and contribute to the restoration of important species.</i>			
Predation and Competition	None developed.	◆◆◆ Reduce level of predation below Woodbridge Dam on the lower Mokelumne River.	None developed.

Notes: Target classification:

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Table 9. Continued.

Ecosystem Element	Eastside Delta Tributaries Ecological Zone		
	Cosumnes River Targets	Mokelumne River Targets	Calaveras River Targets
<i>Implementation Objective: Reduce concentrations and loadings of contaminants in the aquatic environment and the subsequent bioaccumulation by aquatic species in order to increase survival and eliminate public health concerns.</i>			
Contaminants	None developed.	◆ Improve poor water quality problems in the tailwaters of Camanche Dam.	None developed.
<i>Implementation Objective: Reduce the level or incidence of harvest of wild, naturally produced Bay-Delta fish populations and focus harvest on hatchery produced fish in order to protect and increase the productive potential of wild fish populations.</i>			
Harvest of Fish and Wildlife	◆ Develop harvest management strategies that allow spawning populations of wild, naturally produced fish to attain levels that make full use of existing and restored habitat, and focus harvest on hatchery-produced fish.	◆ Develop harvest management strategies that allow spawning populations of wild, naturally produced fish to attain levels that make full use of existing and restored habitat, and focus harvest on hatchery-produced fish.	◆ Develop harvest management strategies that allow spawning populations of wild, naturally produced fish to attain levels that make full use of existing and restored habitat, and focus harvest on hatchery-produced fish.

Notes: Target classification:

◆ =Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 9. Continued.

Ecosystem Element	Eastside Delta Tributaries Ecological Zone		
	Cosumnes River Targets	Mokelumne River Targets	Calaveras River Targets
<i>Implementation Objective: Reduce the potentially adverse effects of stocking artificially produced fish throughout Central Valley rivers and streams in order to increase the survival of naturally produced fish and contribute to long-term restoration goals.</i>			
Artificial Propagation of Fish	Not applicable.	◆ Minimize the likelihood that hatchery produced chinook salmon and steelhead could stray into adjacent non-natal rivers and stream to protect naturally produced fish.	Not applicable.

Notes: Target classification:

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Table 10. Summary of East San Joaquin Basin Ecological Zone Targets.

Ecosystem Element	East San Joaquin Basin Ecological Zone		
	Stanislaus River Targets	Tuolumne River Targets	Merced River Targets
<i>Implementation Objective: Restore basic features of the hydrograph in order to reactivate and maintain ecological processes and functions that create and maintain habitat required to sustain healthy fish, wildlife, and plant populations.</i>			
Central Valley Streamflows	<p>◆◆◆ Maintain the following base flows in the Stanislaus River below Tullock Dam. In critical, dry, and below-normal years, 200-300 cfs, except for a flow event of 1,500 cfs for 30 days in April-May. In above-normal years, 300-350 cfs, except for 800 cfs in June and 1,500 cfs in April and May. In wet years, 300-400 cfs, except for 1,500 cfs from April through June.</p> <p>◆◆ Allow the following 10-day spring flow events on the Stanislaus River: 2,500-3,000 in late April or early May in below normal and above normal years, and 3,000-4,000 cfs in wet years. Such flows</p>	<p>◆◆◆ Maintain the following base flows. In critical years, 50 cfs from June to September, 80 cfs from October to March, and 50-605 cfs in April-May. In dry years, 75 cfs from June to September, 150 cfs from October to March, and 170-985 cfs in April-May. In below-normal years, 75 cfs from June to September, 200 cfs in first half of October, 175-1,075 cfs from mid-October through December, 175 cfs from January-March, and 210-1,428 cfs in April-May. In above-normal years, 300 cfs from January to March, and 500-2,500 cfs in April-May. In wet years, flow releases should be 200 cfs from June through</p>	<p>◆◆◆ Maintain the following base flows in the Merced River below Lake McClure: in dry years minimum instream flows at Shaffer Bridge should be 15 cfs from June to 15 October, 60 cfs from 16-31 October and January through May, and 75 cfs in November-December. and in normal years minimum instream flows at Shaffer Bridge should be 25 cfs from June to October 15. 75 cfs from October 16-31 and January through May, and 100 cfs in November-December.</p> <p>◆◆ Allow the following 10-day spring flow events on the Merced River :1,000-1,500 in late April or early May in dry</p>

Notes: Target classification:

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Table 10. Continued.

Ecosystem Element	East San Joaquin Basin Ecological Zone		
	Stanislaus River Targets	Tuolumne River Targets	Merced River Targets
Streamflows (continued)	would be provided only when inflows to New Melones Reservoir are at these levels.	September, 300-1,450 cfs from October to December, 300 cfs from January to March, and 500-3,000 cfs in April-May. Allow the following 10-day spring flow events on the Tuolumne River: 2,500-3,000 in late April or early May in dry years, 3,500-4,000 cfs in normal years, and 5,000-6,000 cfs in wet years. Such flows would be provided only when inflows to Don Pedro Reservoir are at these levels.	years, 2,000-2,500 cfs in normal years, and 3,000-4,000 cfs in wet years. Such flows would be provided only when inflows to Lake McClure are at these levels.
<i>Implementation Objective: Establish an adequate sediment supply to riverine and estuarine systems in order to restore or reactivate stream channel meander, point bar formation, provide sediments to rebuild wetlands and shallow water habitats, and provide for nutrient transport.</i>			
Natural Sediment Supply	◆◆◆ Restore gravel transport and cleansing process to improve the quality of salmonid spawning gravel to the level necessary to support spawning needs of restored levels of fall-run chinook salmon.	◆◆ Restore gravel transport and cleansing process to improve the quality of salmonid spawning gravel to the level necessary to support spawning needs of restored levels of fall-run chinook salmon.	◆◆ Restore gravel transport and cleansing process to improve the quality of salmonid spawning gravel to the level necessary to support spawning needs of restored levels of fall-run chinook salmon.

Notes: Target classification:

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Table 10. Continued.

Ecosystem Element	East San Joaquin Basin Ecological Zone		
	Stanislaus River Targets	Tuolumne River Targets	Merced River Targets
<i>Implementation Objective: Modify channel and basin configurations in order to improve floodplain function along rivers and streams in the Sacramento-San Joaquin basin.</i>			
Natural Floodplain and Flood Processes	◆◆ Restore natural channel configuration on 2.5-5 miles of disturbed channel.	◆◆ Restore natural channel configuration by isolating 15-30 gravel pits and restoring 6-9 miles of disturbed channel.	◆◆ Restore natural channel configuration by isolating gravel pits and restoring 5-7 miles of disturbed stream channel.
<i>Implementation Objective: Maintain, improve, and restore water temperature regimes in order to meet life history needs of aquatic organisms.</i>			
Central Valley Stream Temperatures	◆◆ Maintain maximum surface water temperature to below the downstream boundary of the salmon spawning area during the fall and winter and to the mouth of the river during the spring as follows: 56°F from October 15 to February 15 and below 65°F from April 1 to May 31.	◆◆ Maintain maximum surface water temperature to below the downstream boundary of the salmon spawning area during the fall and winter and to the mouth of the river during the spring as follows: 56°F from October 15 to February 15 and below 65°F from April 1 to May 31.	◆◆ Maintain maximum surface water temperature to below the downstream boundary of the salmon spawning area during the fall and winter and to the mouth of the river during the spring as follows: 56°F from October 15 to February 15 and below 65°F from April 1 to May 31.

Notes: Target classification:

◆ = Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ = Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ = Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 10. Continued.

Ecosystem Element	East San Joaquin Basin Ecological Zone		
	Stanislaus River Targets	Tuolumne River Targets	Merced River Targets
<i>Implementation Objective: Restore ecological processes in upper watersheds that affect the quantity and quality of water in the Bay-Delta, rivers, and tributaries.</i>			
Upper Watershed Health and Function	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.	◆◆ Protect, restore, and maintain watershed health by developing cooperative approaches to land management.
<i>Implementation Objective: Restore riparian scrub, woodland, and forest habitat along largely unvegetated riprapped banks of Delta island levees, along the Sacramento and San Joaquin Rivers, and along major tributaries of the Sacramento and San Joaquin Rivers in order to create corridors of riparian vegetation that provide shaded riverine aquatic cover for anadromous and other fish species; and to create high-quality habitat for associated special-status plant and animal species, and other associated wildlife.</i>			
Riparian and Riverine Aquatic Habitats	◆◆ Restore 15 miles of self-sustaining diverse riparian community.	◆◆ Restore 15 miles of self-sustaining diverse riparian community.	◆◆ Restore 15 miles of self-sustaining diverse riparian community.

Notes: Target classification:

◆ = Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ = Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ = Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 10. Continued.

Ecosystem Element	East San Joaquin Basin Ecological Zone		
	Stanislaus River Targets	Tuolumne River Targets	Merced River Targets
<i>Implementation Objective: Reduce entrainment of juvenile fish into water diversions by screening or consolidating diversions or by altering diversion timing in order to increase survival and cohort replacement levels.</i>			
Water Diversions	◆◆ Reduce entrainment of fish and other aquatic organisms into diversions to a level that will contribute to restoration of chinook salmon and steelhead by screening 50 percent of the water diverted by volume.	◆◆ Reduce entrainment of fish and other aquatic organisms into diversions to a level that will contribute to restoration of chinook salmon and steelhead by screening 50 percent of the water diverted by volume.	◆◆ Reduce entrainment of fish and other aquatic organisms into diversions to a level that will contribute to restoration of chinook salmon and steelhead by screening 50 percent of the water diverted by volume.
<i>Implementation Objective: Increase the connection of upstream spawning and rearing habitats with the mainstem rivers in the Sacramento-San Joaquin basin in order to increase success of adult spawners and survival of juvenile downstream migrants.</i>			
Dams, Reservoirs, Weirs, and Other Human-Made Structures	◆◆◆ Eliminate the loss of adult fall-run chinook salmon straying from the Stanislaus River into the San Joaquin River upstream of the Merced River confluence.	◆◆◆ Eliminate the loss of adult fall-run chinook salmon straying from the Tuolumne River into the San Joaquin River upstream of the Merced River confluence.	◆◆◆ Eliminate the loss of adult fall-run chinook salmon straying from the Merced River into the San Joaquin River upstream of the Merced River confluence.

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Table 10. Continued.

Ecosystem Element	East San Joaquin Basin Ecological Zone		
	Stanislaus River Targets	Tuolumne River Targets	Merced River Targets
<i>Implementation Objective: Reduce the loss of juvenile anadromous and resident fish and other aquatic organisms from unnatural levels of predation in order to increase survival and contribute to the restoration of important species.</i>			
Predation and Competition	◆◆ Reduce adverse effects of non-native fish species that have a significant effect on juvenile salmon survival.	◆◆ Reduce adverse effects of non-native fish species that have a significant effect on juvenile salmon survival.	◆◆ Reduce adverse effects of non-native fish species that have a significant effect on juvenile salmon survival.
<i>Implementation Objective: Reduce the level or incidence of harvest of wild, naturally produced Bay-Delta fish populations and focus harvest on hatchery produced fish in order to protect and increase the productive potential of wild fish populations.</i>			
Harvest of Fish and Wildlife	◆ Develop harvest management strategies that allow spawning populations of wild, naturally produced fish to attain levels that make full use of existing and restored habitat, and focus harvest on hatchery-produced fish.	◆ Develop harvest management strategies that allow spawning populations of wild, naturally produced fish to attain levels that make full use of existing and restored habitat, and focus harvest on hatchery-produced fish.	◆ Develop harvest management strategies that allow spawning populations of wild, naturally produced fish to attain levels that make full use of existing and restored habitat, and focus harvest on hatchery-produced fish.

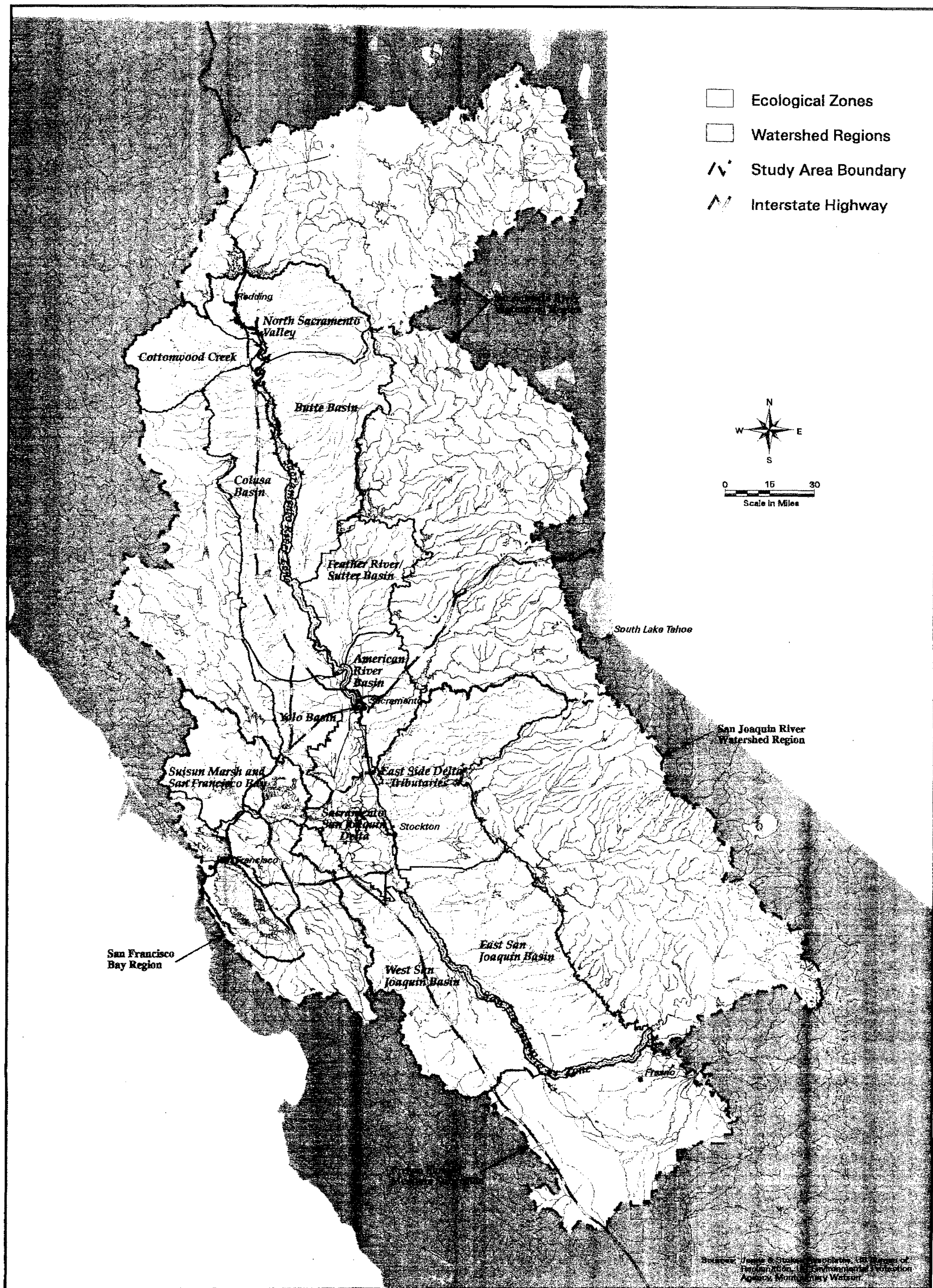
Notes: Target classification:

◆ =Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.

Table 10. Continued.

Ecosystem Element	East San Joaquin Basin Ecological Zone		
	Stanislaus River Targets	Tuolumne River Targets	Merced River Targets
<i>Implementation Objective: Reduce the potentially adverse effects of stocking artificially produced fish throughout Central Valley rivers and streams in order to increase the survival of naturally produced fish and contribute to long-term restoration goals.</i>			
Artificial Propagation of Fish	Not applicable.	Not applicable.	◆ Minimize the likelihood that hatchery produced chinook salmon and steelhead could stray into adjacent non-natal rivers and stream to protect naturally produced fish.

Notes: Target classification: ◆ =Targets for which additional research, demonstration and evaluation are needed to determine feasibility or ecosystem response. ◆◆ =Targets which will be implemented in stages with the appropriate monitoring to judge benefits and successes. ◆◆◆ =Targets that have sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phasing.



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Ecosystem Restoration Program Plan

DRAFT

February 27, 1997

**Figure 1
ERPP Study Area
and Ecological Zones**

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